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OBSERVATIONS AND CALIRATIONS OF DMSP F15 SSM DATA DECEMBER 1999 – OCTOBER 2000

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13. ABSTRACT *(Maximum 200 words)*

This report relates the precise calibration study and other observations of data from the Special Sensor Magnetometer (SSM) mounted on a boom aboard the sun-synchronous, polar-orbiting F15 satellite of the Defense Meteorological Satellite Program (DMSP) at about 850Km altitude. Data was surveyed for the period from launch in December 1999 until October 2000. The efforts described concentrated upon discerning a more precise in-flight calibration of the SSM instrument, examining the precision of that calibration, noting any unusual phenomena measured by the instrument, and searching for any artifacts caused by the mounting of the sensor upon a 5m boom instead of the upon the body of the spacecraft.

Calibration methods, the resulting calibration, and the accuracy of those calibrations are described. Features of the measured ionospheric magnetic field after calibration are illustrated, and attempts are made to attribute those errors to particular sources. The magnetic field impact and mathematical behavior of potential boom-induced artifacts are analyzed and compared to the observed data. The presence, absence, and removal of such features is discussed.

14. SUBJECT TERMS
DMSP F15, Special sensor magnetometer (SSM), Satellite-based magnetometer, Boom-mounted magnetometer, Calibration, Ionospheric magnetic field, Interference

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1. INTRODUCTION

The purpose of this report is to relate the precise calibration study and other observations of the DMSP F15 SSM data since the brief initial examination and calibration related in the "Summary of Efforts Relating to Calibration of the Special Sensor Magnetometer Aboard DMSP F15" report of March 1, 2000. Efforts since that date have concentrated upon attempting to discern a more precise calibration, examine the precision of that calibration, to note any unusual phenomena observed in the data, and to search for any artifacts in the data conceivably caused by the mounting of the sensor upon a 5m boom.

The placement of the sensor on the boom is the major driver of this investigation. Locating the SSM away from the body of the spacecraft should drastically reduce the affect of spacecraft magnetic fields upon the field at the sensor, thereby allowing more accurate measurements. However, with the boom comes the question of whether the mechanics of the boom impact the measurements.

All analyses have been performed using ephemeris generated from Two Line Element sets (TLEs) unless noted otherwise. All source SSM data has consisted of "Boston College" format data files obtained by AFRL. These files contain one day of SSM data from F15, starting at 0000UT. Unless specifically stated otherwise, only data from days 2000-005 through 2000-305 were used.

DMSP F15 has an orbital period of about 6120 seconds, or 14.12 orbits per day. Its sun-synchronous, very low eccentricity polar orbit has an altitude of about 850km. Approximate Local Time of the ascending and descending nodes is 2124UT and 0924UT, respectively.

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2. IN-FLIGHT CALIBRATION

Before launch, the SSM sensor is calibrated to determine the relationship between measurements in counts and real engineering values. After an SSM-bearing DMSP satellite is launched, an in-flight calibration is performed. This calibration corrects for cross-talk amongst the three magnetometers and for any constant offsets to the field caused by spacecraft-ambient magnetic fields. Anywhere within this document a calibration is referred to, it is the in-flight calibration unless explicitly stated otherwise.

2.1 Form Of The Calibration

For a measured magnetic field vector [Bx By Bz] in NanoTesla, the ORTHO and OFFSET matrices are applied to generate the calibrated measured magnetic field vector B.

$$[B_{true}] = [ORTHO]*[B] + [OFFSET]; \text{ that is,}$$

$$\begin{bmatrix} B_{x\_true} \\ B_{y\_true} \\ B_{z\_true} \end{bmatrix} = \begin{bmatrix} ORTHO_{11} & ORTHO_{12} & ORTHO_{13} \\ ORTHO_{21} & ORTHO_{22} & ORTHO_{23} \\ ORTHO_{31} & ORTHO_{32} & ORTHO_{33} \end{bmatrix} \begin{bmatrix} B_x \\ B_y \\ B_z \end{bmatrix} + \begin{bmatrix} OFFSET_x \\ OFFSET_y \\ OFFSET_z \end{bmatrix}, \text{where:} \quad (1)$$

$[B_{true}]$ = the calibrated magnetic field,
[B] = the measured magnetic field before calibration, and
[ORTHO] and [OFFSET] are the calibration matrices
where X is down, Y is in the direction of motion, and Z is in the direction of the satellite orbit normal.

It should be noted that while this calibration can correct constant gain errors and account for contributions from all three magnetometers in each dimension for field measurements of various magnitudes, it cannot correct for time-dependent errors.

2.2 Method Of Determining The Calibration

The calibration is determined by performing a least squares fit of the measured data for a period of low ionospheric magnetic activity to the latest available IGRF geomagnetic model, in this case IGRF 2000 to the 11^{th} order. While this calibration is based on the assumption that for a "quiet" period of low magnetic activity the measured field should equal the modeled field, a further precautionary step is taken: those periods of data when the instrument is expected or graphically observed to have measured activity in the auroral regions are "clipped" or not considered for the fitting, as described in Section 2.3.5. Finally, data from multiple orbits is used in an effort to dampen the affects of any orbit-dependent inaccuracies.

2.3 Potential Effects Of Various Errors

The first step in studying the precision of the SSM in-flight calibration is an understanding of what error is present in that calibration.

2.3.1 Instrument Precision

The precision of the SSM instrument measurements is the absolute limit on the precision of any analysis of the SSM data. SSM measurements consist of a fine measurement and a range measurement. A one-bit change in the fine measurement equates to 2 nanoTesla, which for the entire 12 bits equates to the range measurement precision of approximately 4100nT per bit. Due to this limit, most results below are presented only to the nearest nT as anything more precise would be nonsensical. Note that this describes only the precision, or how fine a measurement the instrument is capable of, not the accuracy, which is whether the instrument will produce the same measurements from the same data repeatedly.

2.3.2 Geomagnetic Model Field Drift

The basic premise of the SSM in-flight calibration process is that under ideal circumstances, the field measured by the SSM is equal to the geomagnetic field plus the ionospheric magnetic field. When the ionospheric field can be neglected, the measured field ideally is equal to the geomagnetic field, which is modeled using IGRF coefficients. However, the IGRF model is issued every 5 years, with coefficients for the field at the epoch of issue and for the rate of change of the model field over time. The difference between the field calculated from the IGRF 1995 coefficients and one calculated from the IGRF 2000 coefficients on a day near January 1, 2000 is an estimate of the magnitude of the error in the model field due to time distance from the epoch of the coefficients.

For Day 2000-006, this difference had a range of:

X: -200 to 190nT
Y: -170 to 160nT
Z: -150 to 130nT
Total Magnitude of difference: 0 to 210nT.

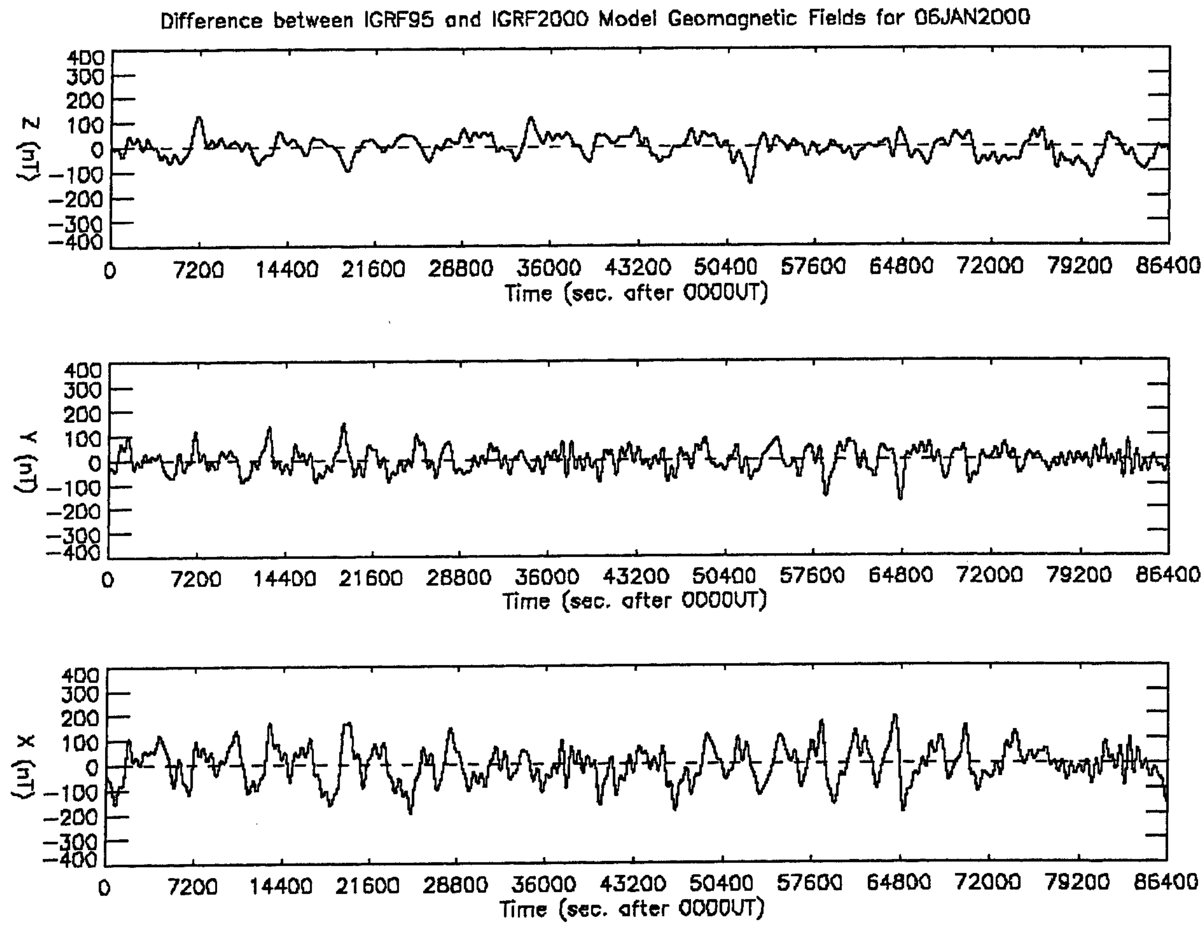


Figure 1. Change in Geomagnetic Model Field From IGRF95 to IGRF2000.

For day 2000-006, the first ascending node occurs at approximately 3799 seconds UT.

Based on a linear assumption of the rate of increase in error in the coefficients, that means that the maximum error could be assumed to grow as follows:

X: +/-3.2nT/30days
Y: +/-2.7nT/30days
Z: +/-2.3nT/30days
Total Magnitude of difference: 3.4nT/30days

The reduction in average absolute difference between the measured and modeled fields for IGRF 1995 to IGRF 2000 for that day was:

X: 42nT
Y: 11nT
Z: 17nT
Total Magnitude of difference: 44nT

Based on a linear assumption of the rate of increase in error in the coefficients, that means that the average error could be assumed to grow as follows:

X: 0.68nT/30days
Y: 0.17nT/30days
Z: 0.27nT/30days
Total Magnitude of difference: 0.72nT/30days

It should be noted that the linear assumption of increasing error in model over time is not necessarily valid. However, these figures do give an order-of-magnitude estimation for the errors involved.

2.3.3 Potential Ephemeris Errors

The comparison of the modeled and measured field requires knowledge of where the measurements were taken in order to determine the corresponding model field. Therefore ephemeris error can contribute to inaccuracies in the calibration. While the effect of random error due to imprecision of the ephemeris would hopefully be reduced by the use of multiple days of data for the calibration, any potential inaccuracies are unlikely to be thus reduced. See APPENDIX G for a discussion of TLE quality.

It is worth noting that as the ephemeris is generated over an orbit, it is likely that any ephemeris error will have an orbitally periodic affect, which mimics the orbitally periodic measured variation in the magnetic field. That is, the same ephemeris error will be in the same direction at the same point in the orbit, and the geomagnetic field will be similar at the same point in the orbit. As consecutive DMSP orbits are very similar, it is likely that both ephemeris errors and magnetic field errors, if any, would cause similar periodic patterns in the data.

Due to the nature of the observation and fitting process used to generate TLEs, it is expected that the position error they represent would most likely be in-track. Such an error was simulated by increasing the eccentricity of the orbit to yield an in-track position error over two consecutive orbits worth of data. This had the following results:

The difference between the modeled fields for unchanged eccentricity vs. eccentricity yielding a +/-1km error was a sinusoid in the range of:

X: -14 to +18nT
Y: -11 to +7nT
Z: -6 to +3nT
Total Magnitude of difference: 1 to 18nT

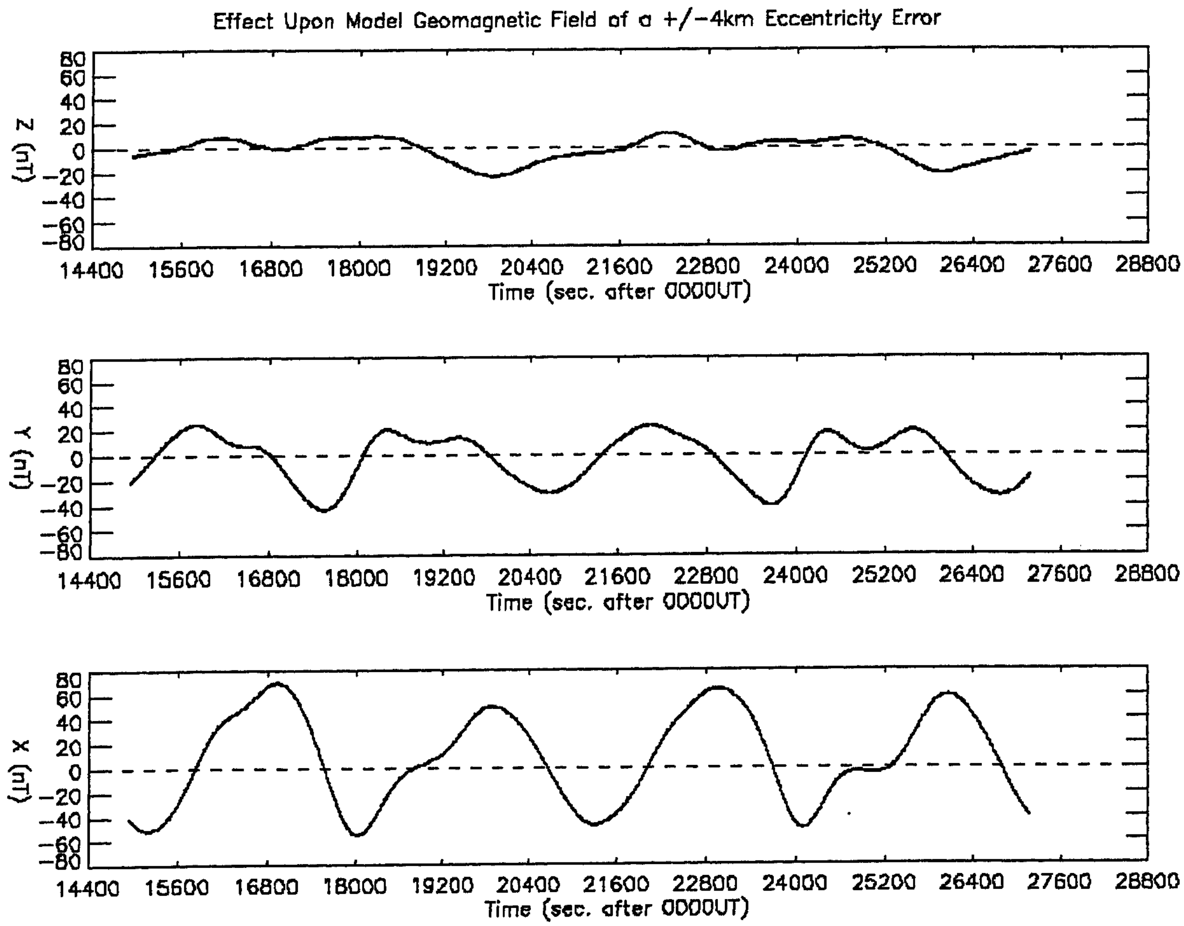


Figure 2. Effect Upon Model Geomagnetic Field of a +/-4Km Eccentricity Error.

The increase in average absolute difference between the measured and modeled fields for unchanged eccentricity vs. eccentricity yielding a +/-1km error was:

X: -2nT
Y: 0nT
Z: 1nT
Total Magnitude: -1nT

The range in difference between the modeled fields for unchanged eccentricity vs. eccentricity yielding a +/-4km error was:

X: -58 to +72nT
Y: -45 to +25nT
Z: -24 to +12nT
Total Magnitude: 6 to 71nT

The first ascending node in the above plot occurs at approximately 14945 seconds UT.

The increase in average absolute difference between the measured and modeled fields for unchanged eccentricity vs. eccentricity yielding a +/-4km error was:

X: +3nT
Y: +1nT
Z: +5nT
Total Magnitude: +5nT

2.3.4 Potential Time Error

The measured field and modeled field are matched by time. If measurements are tagged as having been made at time T, then spacecraft position is calculated from TLEs for time T, and the model field for that position is then compared to the measured field for time T. The purpose of this Section is to gain an idea of the magnitude of error possible due to one or more of these time-tags being out of phase. Whether the potential time error is conceived of as due to a TLE giving the correct position but the wrong time, or to measurements not being tagged with the correct time, the result would be the same: a model field that is out of phase with the measured field.

A 1.0sec phase difference in the model field resulted in a sinusoidal error in the range:

X: +/-65nT
Y: -28 to +33nT
Z: -9 to +12nT
Total Magnitude of difference: 3 to 66nT

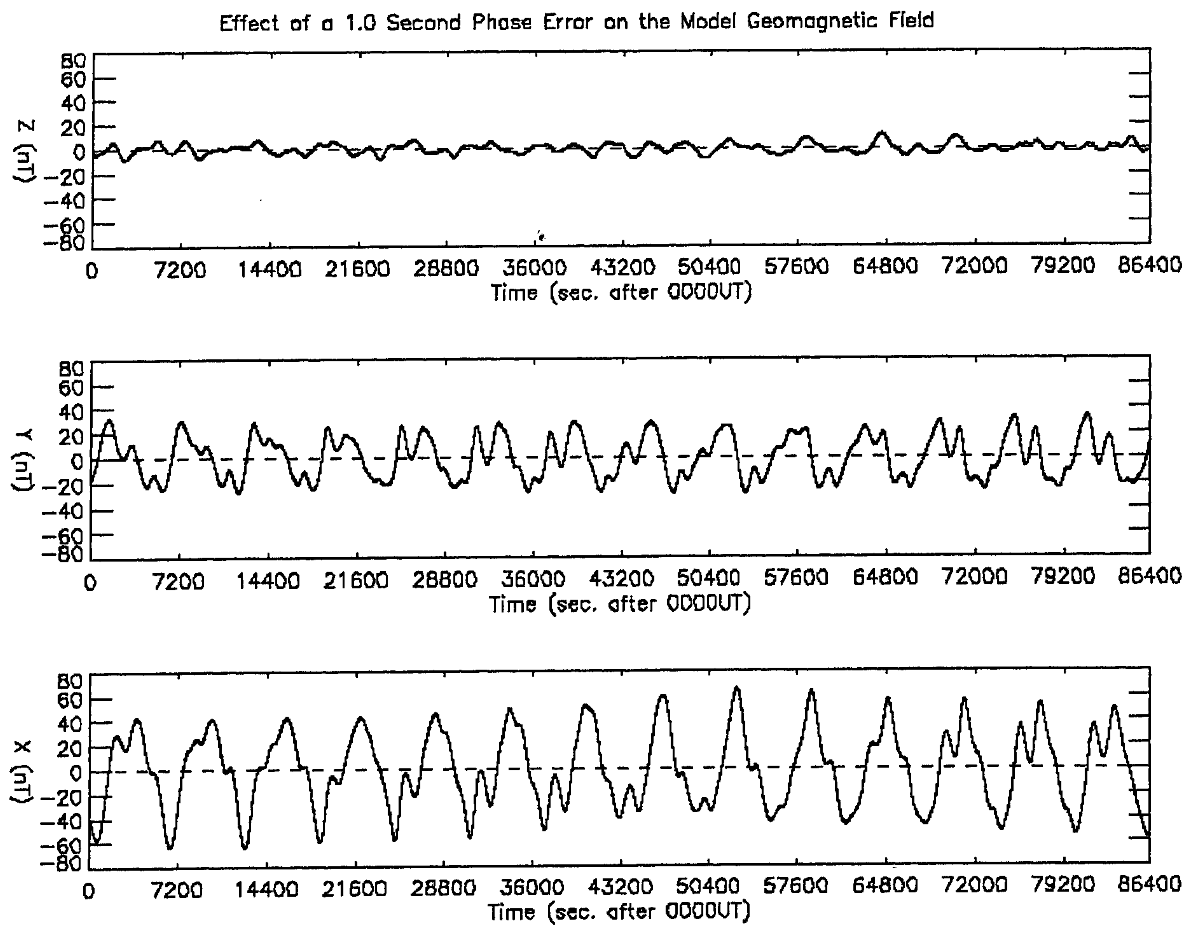


Figure 3. Effect of a 1.0 Second Phase Error on the Model Geomagnetic Field.

The first ascending node in the above plot occurs at approximately 3952 seconds UT.

The increase in average absolute difference between the measured and modeled fields for unchanged time vs. time + 1second for that day was:

X: 12nT
Y: 1nT
Z: 1nT
Total Magnitude: 9nT

2.3.5 Clipping

Clipping refers to the process of leaving out some data when calculating the in-flight calibration that produces the best match of measured to modeled. The calibration process is theoretically best when no ionospheric activity is present in the data so that measured should be equal to modeled. However, even on very "quiet" days, there is measurable ionospheric activity in the

auroral regions. The clipping process removes these auroral regions in order to calculate a calibration based solely on the data that meets the assumptions of the calibration process.

A combination of automatic and manual methods was used to snip. First, data from 12 geographic degrees of latitude equatorward, and 8 degrees poleward, of the predicted auroral region for a Q index of 2, was neglected. Then the data was examined graphically and a secondary list of those few regions missed by the automatic method was manually removed. In most cases, these regions occurred for those orbits that had above average activity compared to the rest of the day.

Three consecutive days of data were used to test the effect of clipping. By using consecutive days, it was hoped that the impact of other error sources could be minimized.

The range of errors between the three days as a result of calibrations derived with and without clipping was were sinusoids in the following ranges:
Day 2000-253:

X: -36 to 24nT
Y: -17 to 11nT
Z: -3 to –13nT
Total Magnitude of Error: 5 to 36nT

Day 2000-254:

X: -36 to 25nT
Y: -14 to 5nT
Z: -3 to –13nT
Total Magnitude of Error: 5 to 37nT

Day 2000-255:

X: -37 to 27nT
Y: -12 to 5nT
Z: -11 to –1nT
Total Magnitude of Error: 3 to 39nT

The three days had mean day Ap's of 4 to 5.

A second comparison was performed. The auroral regions from two orbits of data with Ap's near zero from day 2000-076 were curve-fitted by hand to generate near-perfect data. This data was then used to generate a calibration without errors due to clipping or ionospheric activity, and the resulting calibration compared with a clipped calibration for the same day. The error due to clipping for these orbits was a sinusoid in the range:

X: -42 to 48nT
Y: -39 to 24nT
Z: -17 to 6nT
Total Magnitude of Error: 5 to 57nT

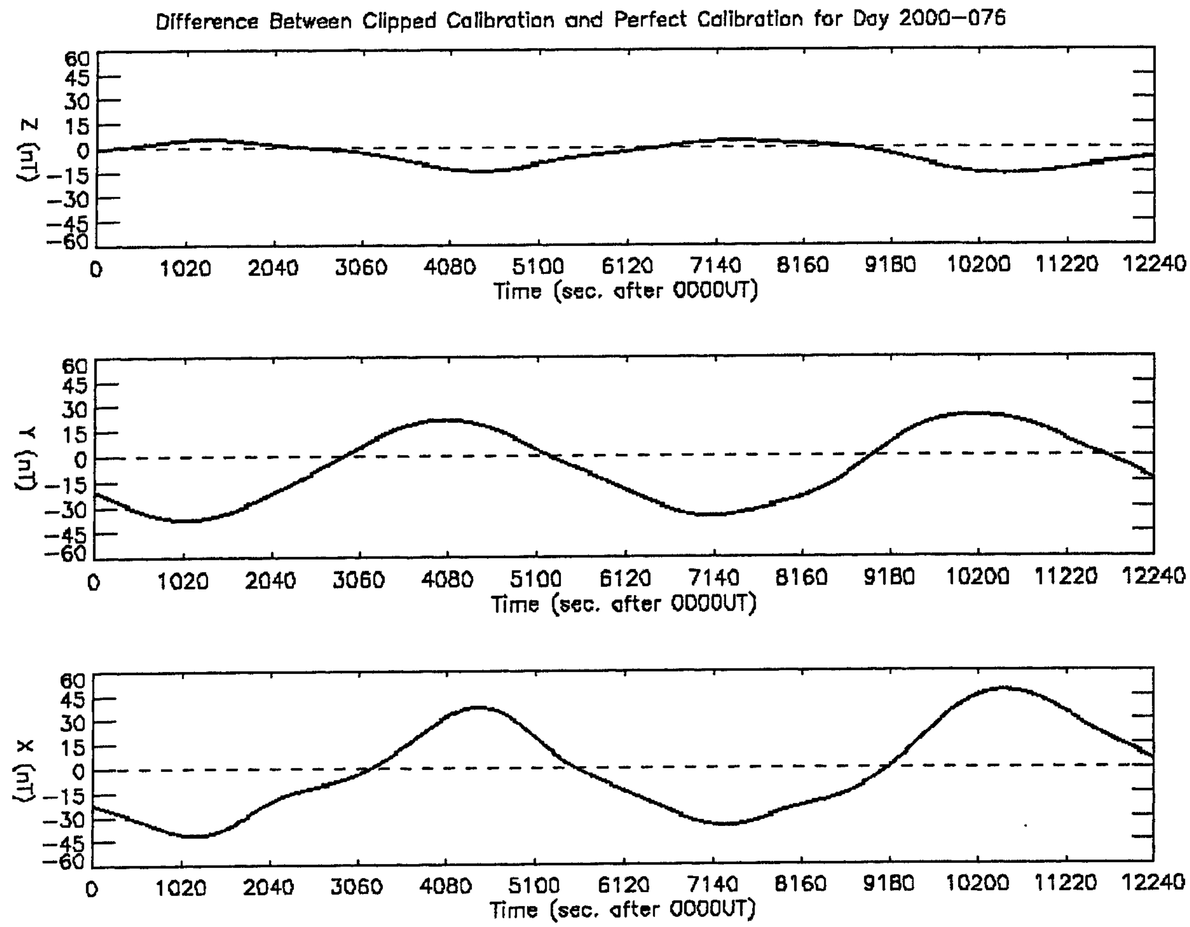


Figure 4. Difference Between Clipped Calibration and Optimal Calibration.

The first ascending node in the above plot occurs at approximately 68 seconds UT.

By comparing the a calibration based on the unclipped data for those two orbits to the calibration based on the curve-fitted data, it can be seen that the error due to the presence of the auroral regions even for this extremely quiet period was a sinusoid in the range:

X: -9 to 11nT
Y: -8 to 6nT
Z: -3 to 6nT
Total Magnitude of Error: 1 to 13nT

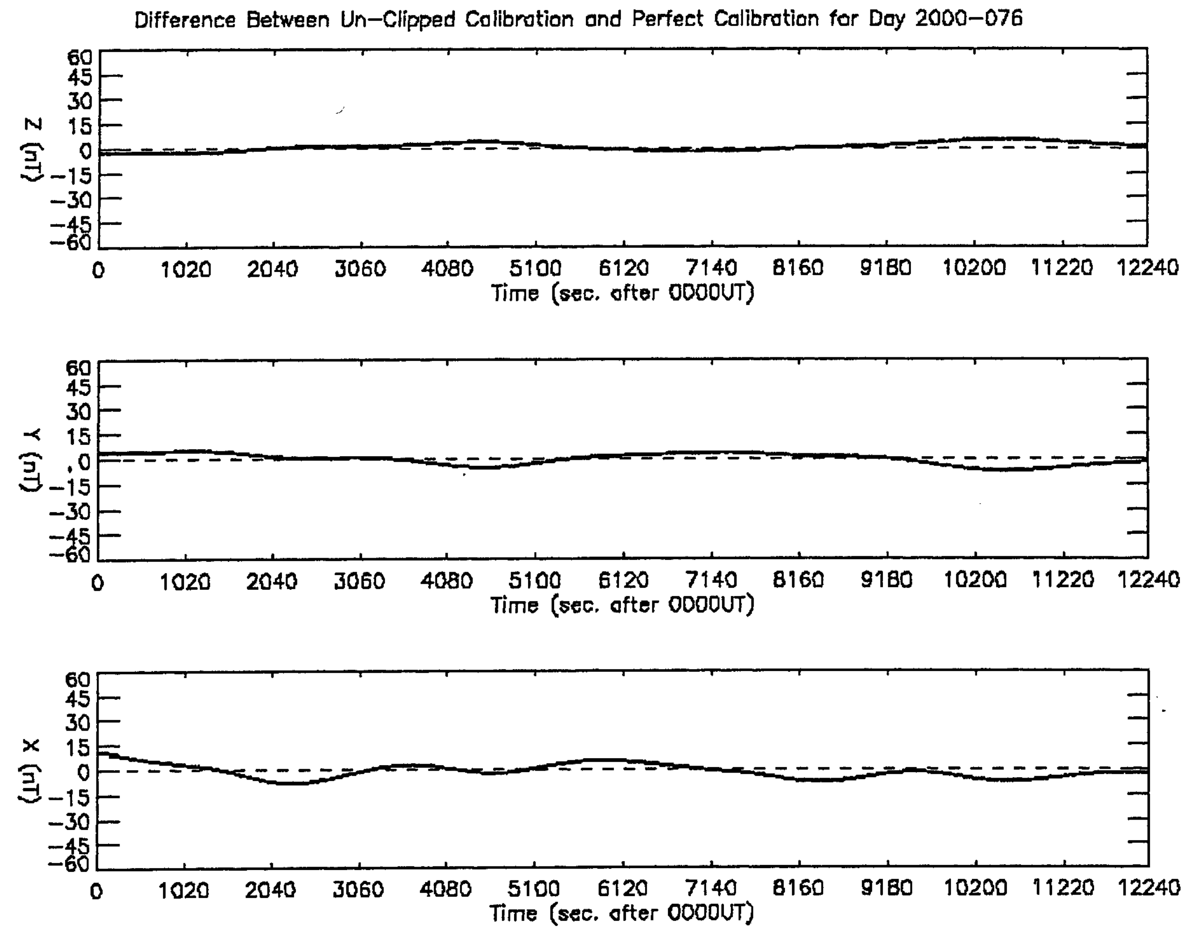


Figure 5. Difference Between Unclipped and Optimal Calibration.

The first ascending node in the above plot occurs at approximately 68 seconds UT.

While the initial observation is that clipping does more harm than good, it should be noted that finding more than two consecutive extremely quiet orbits is well nigh impossible. Lacking a large amount of very quiet data, a calibration without clipping must either be based on a limited amount of data with no hope of averaging out orbit-dependent differences, or must include a substantial number of orbits containing a relatively high amount of activity. The solution of curve-fitting the auroral regions of large numbers of orbits must be excluded as it is both subjective and enormously time consuming; the latter factor would make repeatability, evaluation, and use upon multiple days within a year prohibitive.

2.3.6 Accuracy of the Calibration Process for One Day of Data

Even with clipping, and using multiple orbits for the calibration, some error will remain due to non-auroral ionospheric activity, ephemeris error, imperfect clipping, bias due to clipping, accuracy of the model geomagnetic field, and other non-ideal factors. Three successive days

were used to generate three calibrations, and the effects of those calibrations upon the measured-minus-modeled field were evaluated to determine the maximum possible precision of the calibration process. It should be noted however, that the use of multiple days of data to generate each calibration should reduce some of these errors, but the lack of sufficient consecutive quiet days of data precluded such an analysis.

The range of the differences between three consecutive calibrations based on a full day's data is given below:

Day 2000-253 vs. day 2000-254:
- X: +/-5nT
- Y: +/-11nT
- Z: -2 to 0nT
- Total Magnitude of Error: 1 to 12nT

Day 2000-254 vs. day 2000-255:
- X: +/-8nT
- Y: +/-12nT
- Z: -7 to 1nT
- Total Magnitude of Error: 3 to 14nT

Day 2000-253 vs. day 2000-255:
- X: +/-12nT
- Y: +/-20nT
- Z: -8 to 0nT
- Total Magnitude of Error: 8 to 21nT

The change in absolute average measured-minus-modeled field for each day between the three calibrations is given below:

Day 2000-253 vs. day 2000-254:
- X: 1nT
- Y: 1nT
- Z: 0nT
- Total Magnitude of Error: 0nT

Day 2000-254 vs. day 2000-255:
- X: 1nT
- Y: 0nT
- Z: 1nT
- Total Magnitude of Error: 0nT

Day 2000-253 vs. day 2000-255:
- X: 2nT
- Y: 1nT
- Z: 1nT
- Total Magnitude of Error: 0nT

2.3.7 Other Potential Sources of Calibration Error

Other potential sources of calibration error include sensor break-in, sensor drift, seasonal or day/night variation in temperature resulting in boom twist, error in the model field, magnetic activity other than clipped auroral activity, and unknown artifacts in the data. It bears repeating that the form of the calibration limits the type of error that can be corrected. Only those errors that are functions of the magnetic field are conceivably corrected; time and date dependent errors not only cannot be corrected by this calibration, they limit the accuracy of calibration. See Section 3 for a discussion of some of the phenomena observed in the data.

2.4 Preliminary Calibration Matrices

While the rigorous calibration process described in Section 2.2 was eventually performed to yield the early and late calibrations given in Sections 2.5 and 2.6, those calibrations could only be performed after substantial evaluation of the data. Evaluation of the data required preliminary calibrations to allow graphical and other analysis without the dominating effect of the lack of a calibration. Accordingly, preliminary calibrations were developed as described below. It should be noted that the definitive early and late calibration matrices were not used in the experiments discussed in Sections 4 and in [*Sexton and Cook*, 2000]. These experiments were performed with preliminary calibration matrices instead.

2.4.1 Preliminary Late Calibration Matrices

A preliminary version of the early calibration matrices was used for all studies in Section 4.9 except for the in-flight recalibration. A preliminary version of the late in-flight calibration matrices was computed for each of the following days:

Day 2000-231: 08/18/2000
Day 2000-233: 08/20/2000
Day 2000-235: 08/22/2000
Day 2000-238: 08/25/2000

Their calibration matrices are listed below:

ORTHO			OFFSET
18 August 2000 (Day 2000-231)			
0.99198131	0.00581004	0.00879947	-30.23
0.00004992	0.99574205	-0.00289133	-4.34
0.00205065	-0.00281425	0.98931262	2.54
20 August 2000 (Day 2000-233)			
0.99203124	0.00533068	0.00874869	-30.59
0.00008274	0.99539845	-0.00348888	-4.76
0.00202968	-0.00243739	0.98914056	2.88

22 August 2000 (Day 2000-235)

0.99189387	0.00410800	0.01109731	-27.21
0.00067430	0.99582770	-0.00242590	-6.55
0.00071572	-0.00320961	0.99006950	2.54

25 August 2000 (Day 2000-238)

0.99204054	0.00329139	0.00992527	-33.17
0.00048404	0.99545452	-0.00236634	-2.09
0.00063384	-0.00333600	0.99052002	6.67

By a very slim margin, the calibration matrices from Day 2000-231 appear to be the most typical of the four, and were used as the preliminary late calibration for F15.

It is noteworthy that these differences among the days are very close to the same level as those among the previous calibration from early March 2000.

The ORTHO calibration matrix for Day 2000-231 was converted to rotation angles A, B, and C to compare these angles with the angles in the first table of Section 4.9.1.2, which deals with the field-versus-time plots. The converted angles for Day 2000-231in degrees were:

A = -0.165668
B = -0.504179
C = 0.332906

The above solution angles were checked and found to be fairly precise.

2.4.2 Preliminary Early Calibration Matrices

In addition to the above calibration matrices for Day 2000-231, preliminary early calibration matrices were also selected. Among the matrices for Days 2000-009, 2000-012, 2000-017, and 2000-025, Day 2000-012 was chosen.

The ORTHO calibration matrix for Day 2000-012 was converted to rotation angles A, B, and C to compare these angles with the angles in the first table of Section 4.9.1.2, which deals with the field-versus-time plots. The converted angles for Day 2000-012 in degrees were:

A = -0.140528
B = -0.712907
C = 0.410781

The above solution angles were checked and found to be fairly precise.

2.4.3 Preliminary Late Versus Preliminary Early Calibration Matrices

A comparison plot of the difference between the measured-minus-modeled field for Day 2000-145 using the preliminary early and the preliminary late calibrations yielded smooth curves,

except for jump discontinuities in the Z-axis curve at UT = 50,990 seconds and UT = 53,000 seconds. For each axis (X, Y, or Z), the maximum absolute field strength in the difference was:

56 nT for the X-axis
44 nT for the Y-axis
184 nT for the Z-axis

The average absolute values of field strength were:

21.75 nT for the X-axis
21.17 nT for the Y-axis
35.23 nT for the Z-axis

2.5 Final Early Calibration

With the errors discussed above in mind, a precise early in-flight calibration was attempted. In order to average-out day-to-day errors without introducing long-period errors, three consecutive quiet days were desired. However, the concentration of days exhibiting or possibly exhibiting the Z-wave phenomena (Section 3.3) in the early part of the year meant that the first group of suitably quiet days was not available until days 049, 050, and 051 of year 2000. The days were snipped automatically and manually, and the fields from all three days combined to average out error. This calibration differs from those listed in the March 2000 calibration report due to the use of rigorous clipping, the availability of early year TLEs, the use of 3 days of data instead of just one. The resultant calibration was:

$$\begin{bmatrix} B_x' \\ B_y' \\ B_z' \end{bmatrix} = \begin{bmatrix} 0.99528597 & 0.00917236 & 0.00593256 \\ -0.00033594 & 0.99729121 & -0.00337577 \\ 0.00108272 & -0.00326025 & 0.99352186 \end{bmatrix} \begin{bmatrix} B_x \\ B_y \\ B_z \end{bmatrix} + \begin{bmatrix} -20.65 \\ -13.17 \\ -1.77 \end{bmatrix} \tag{2}$$

2.6 Final Late Calibration

With the errors discussed above in mind, a precise late in-flight calibration was attempted. In order to average-out day-to-day errors without introducing long-period errors, three consecutive quiet days were desired. The days 253, 254, and 255 of year 2000 were selected. The days were snipped automatically and manually, and the fields from all three days combined to average out error. This calibration differs from those listed in the March 2000 calibration report due to the use of rigorous clipping, the availability of early year TLEs, the use of 3 days of data instead of just one, and of course the fact that it is some 6-7 months later. The resultant calibration was:

$$\begin{bmatrix} B_x' \\ B_y' \\ B_z' \end{bmatrix} = \begin{bmatrix} 0.99517418 & 0.00863488 & 0.00699771 \\ -0.00055869 & 0.99756404 & -0.00291095 \\ 0.00022768 & -0.00329771 & 0.99405258 \end{bmatrix} \begin{bmatrix} B_x \\ B_y \\ B_z \end{bmatrix} + \begin{bmatrix} -16.65 \\ -10.14 \\ -0.68 \end{bmatrix} \tag{3}$$

2.7 Differences Between Early And Late Final Calibrations

Both calibrations were used to process data from day 2000-253.

The range of the differences between the effects of the two calibrations are:

X: +/-18nT
Y: +/-15nT
Z: +/-38nT
Total Magnitude: 8 to 41nT.
Typical angle difference: 0.0239deg
Typical magnitude difference: 11nT

Where "Typical angle difference" is the angle between the resulting vectors of applying the two calibrations to a field vector of [18000 18000 18000]nT, and "Typical magnitude difference" is the difference in magnitude between those two resulting calibrated vectors.

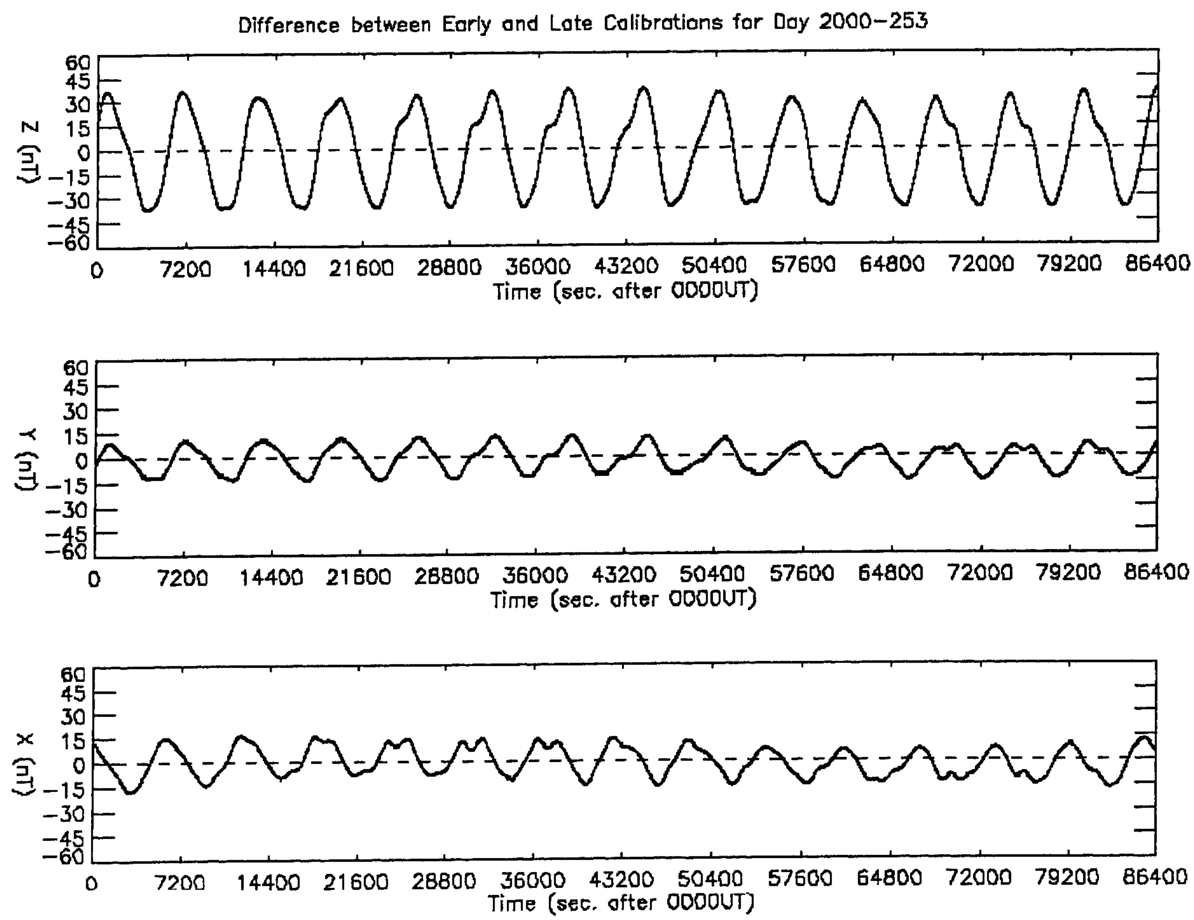


Figure 6. Difference Between Final Early and Late Calibrations.

The first ascending node in the above plot occurs at approximately 2799 seconds UT.

Since day 253 is much closer chronologically to the later calibration than the earlier one, it was expected that the average absolute difference between measured and modeled fields would be lower for the later calibration versus the earlier one. The following were the amounts by which the average absolute differences were reduced for day 2000-253 by using the later calibration vice the early calibration:

X: 2.4nT
Y: 0.3nT
Z: 6.7nT
Total Magnitude: 4.8nT.

2.8 Switchover Date From Early Calibration To Later Calibration

With the various potential and actual factors causing the need for regular recalibration, the question arises: upon which date should the processing of SSM DMSP F15 data switch from one calibration to the later one? Given the precision of the calibration (Section 2.9), the accuracy of the calibration process (Section 2.3.6), versus the unknown or comparatively small magnitude (Section 2.3.2) changing factors, it is obvious that this question cannot be answered precisely.

An estimate was obtained by calculating the average absolute difference between the measured and modeled field for each orbit of data, using both calibrations. These two sets of results represent how close the measured field was to the modeled field for each orbit. By differencing the two results for each orbit, an estimate of how much better one calibration is than the other is obtained. The differences where the Ap for that orbit is 20 or less are then plotted in each axis and for magnitude. As expected, the plots of these differences are not smooth curves, but some trends may be observed. Based on these curves, it is suggested that processing of data use the later calibration from day 098 of 2000 onward, and the earlier calibration before that time. Note that axis and magnitude difference plots displayed the same behavior whether the average absolute differences being compared included auroral regions or not.

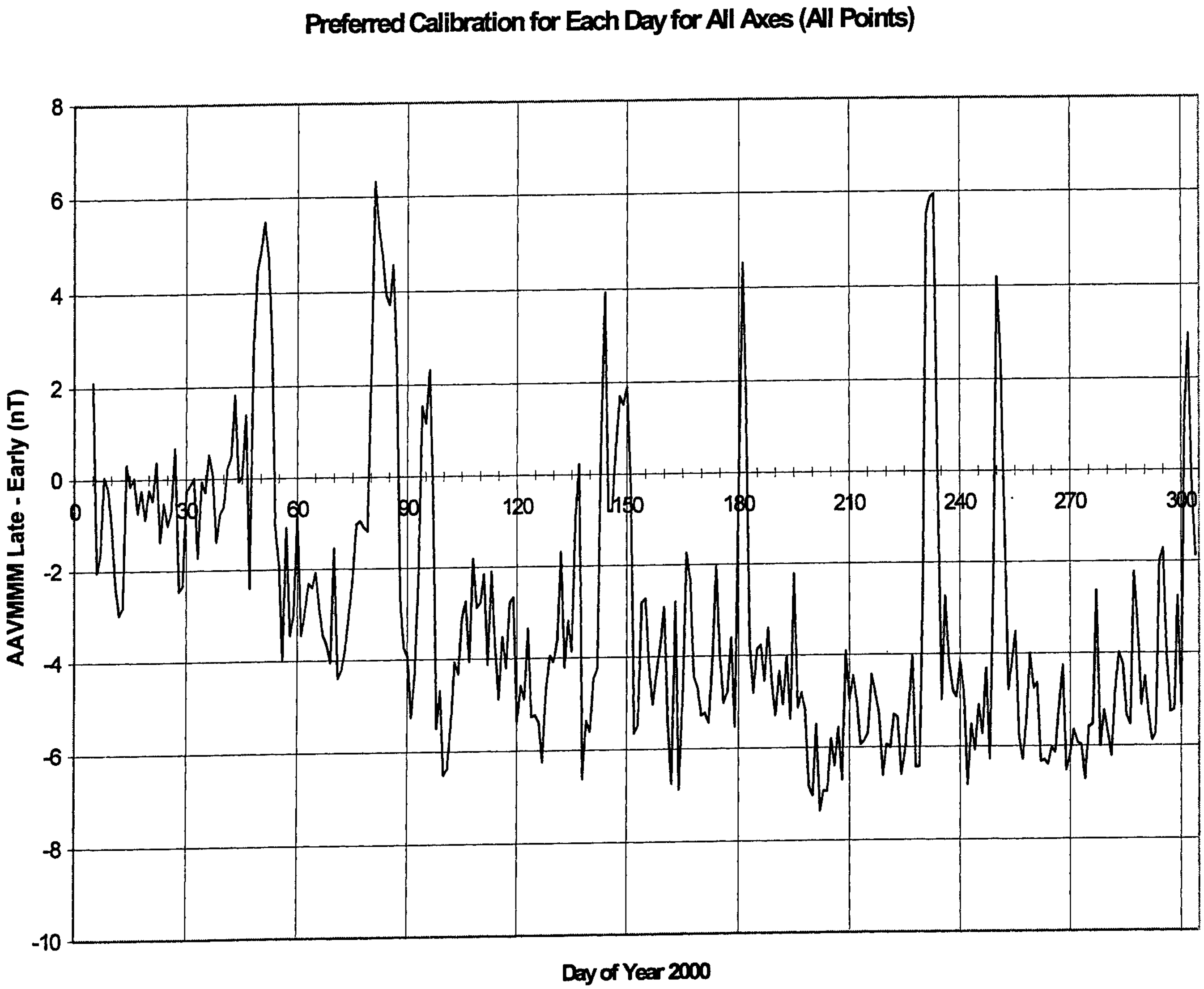


Figure 7. Determining Preferred Calibration for Each Day for All Axes.

2.9 Precision Of The Calibration

As the calibration attempts to zero the difference between the measured and modeled fields for quiet periods, the resultant calibrated measured-minus-modeled field is considered to indicate the precision of the calibration. These values were plotted, and typical results can be seen Section 3.1. The average difference from zero of the measured-minus-modeled field for quiet days was therefore studied. This value showed ranges in each axis, and when broken down on a per orbit basis. Table 1 defines the precision of the calibration:

TABLE 1. Precision of the Calibration

Axis	Average (nT)	Amplitude of Representative Sinusoid (nT)	Range (nT)	Amplitude Range of Representative Sinusoid (nT)
X (down)	25	39	21-30	33-47
Y (velocity)	44	69	38-52	60-82
Z (orbit normal)	25	39	14-52	22-82
Magnitude	64	101	52-89	82-140

These values are for non-auroral regions on quiet days, excluding outliers. Precisely speaking, they are determined from the most typical 93 percent of points in each axis, where each data point is the average distance from zero of the measured minus modeled field in non-auroral regions for one day UT. Only days with Aps of 20 or less were considered, and auroral regions were defined per the same criteria as automated clipping. See Section 2.3.5 for a description of clipping criteria. The 93 percent cut-off of outlying points was chosen graphically and to avoid those days affected by the Z-wave described in Section 3.3. Only days 005 through 304 of year 2000 were available to contribute to this estimation. Amplitude of a representative sinusoid is the amplitude of a sinusoidal function that would have that same average difference from zero of the measured-minus-modeled field.

These results are consistent with the curves observed in the plots of measured-minus-modeled field. See Section 3.1 for an example.

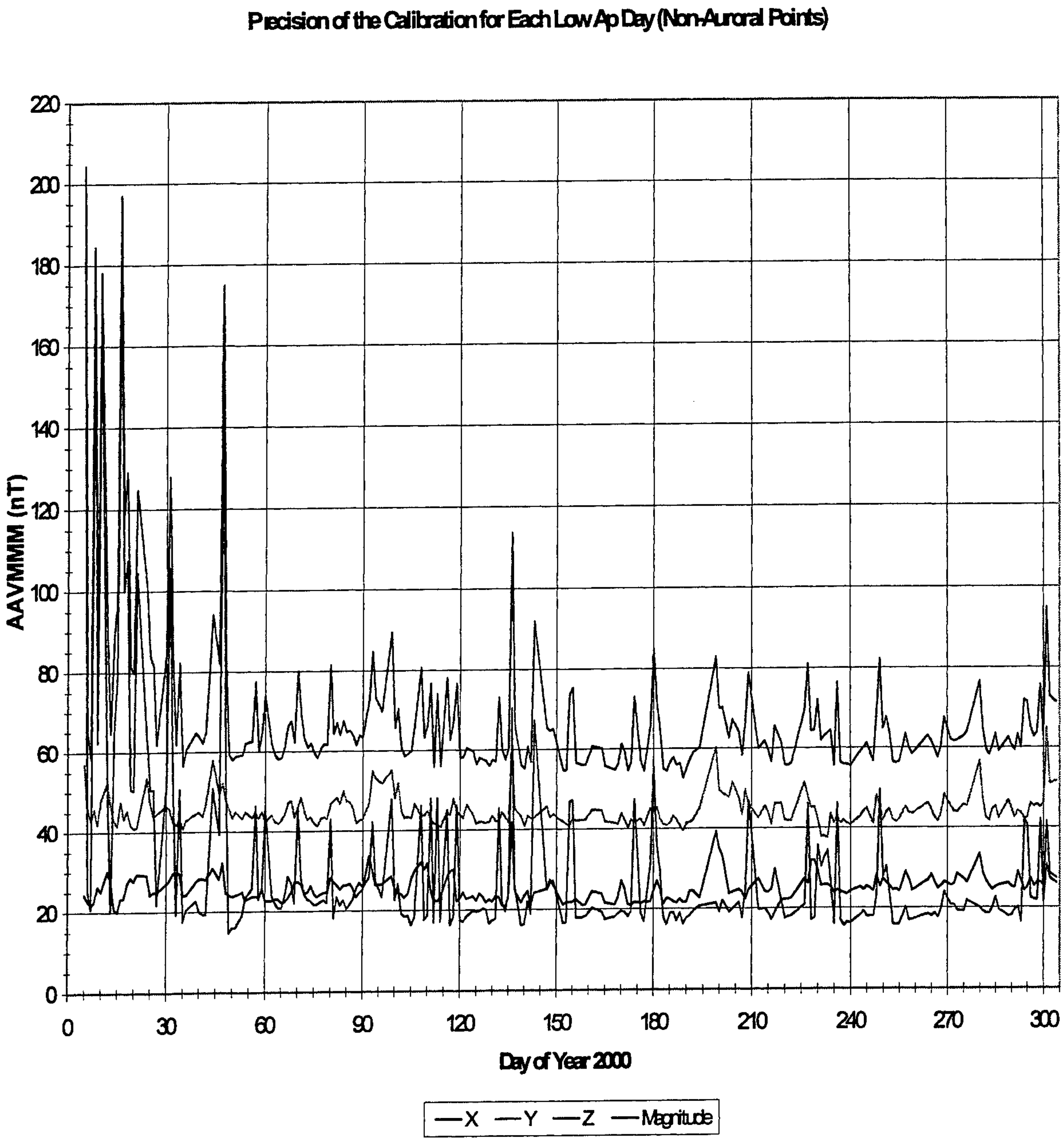


Figure 8. Precision of the Calibration for Each Low Ap Day.

2.10 An Attempt To Calculate Calibration Drift

In part, the calibration represents a correction for a continual twist by applying an opposite twist. Thus, the change in calibration over the study period of several months should have the same magnitude as, but the opposite direction of, the change in continual twist over this study period.

Unfortunately, because of the cyclical nature of the field and the resulting effect of continual twist or calibration, one cannot compare the average or maximum nT computed below in Section 4.9.1. For example, the change in nT due to a new twist on a new date can be the same amount, but in a different direction, or at a different time. While that will show up to some extent (because we are examining the effect on the vector field), it should be done in a manner easier to grasp. For the purposes of the comparison, we will ignore the OFFSET matrix (i.e. the 3x1 additive correction matrix) because it is not solved for as part of the continual twist.

The continual twist for each day of prepfile data is recorded in the first table of Section 5.9.1.2 below as three perpendicular angles A, B, and C. Hence to make the comparison meaningful, we first convert each of the old and new ORTHO calibration matrices to rotation angles A, B, and C. Another important quantity, the 3-D total twist, can then be computed as:
Total = sqrt($A^2 + B^2 + C^2$).

The ORTHO calibration matrices for Days 2000-012 and 2000-231 are repeated here for reference.

12 January 2000 (Day 2000-012)

0.99195034	0.00716887	0.01244225
0.00071688	0.99665388	-0.00245248
0.00104727	-0.00427213	0.99086193

18 August 2000 (Day 2000-231)

0.99198131	0.00581004	0.00879947
0.00004992	0.99574205	-0.00289133
0.00205065	-0.00281425	0.98931262

We must express each ORTHO matrix as a rotation of three angles in the form $R_A R_B R_C$, where:

$$R_A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & cA & sA \\ 0 & -sA & cA \end{bmatrix}, \quad R_B = \begin{bmatrix} cB & 0 & -sB \\ 0 & 1 & 0 \\ sB & 0 & cB \end{bmatrix}, \quad R_C = \begin{bmatrix} cC & sC & 0 \\ -sC & cC & 0 \\ 0 & 0 & 1 \end{bmatrix}, \tag{4}$$

cA, cB, and cC are shorthand for cos(Aπ/180), cos(Bπ/180), and cos(Cπ/180), respectively, and sA, sB, and sC are shorthand for sin(Aπ/180), sin(Bπ/180), and sin(Cπ/180), respectively. The π/180 adjustment is due the fact that A, B, and C are the twist angles in degrees, not radians.

We write out the product $R_A R_B R_C$ as:

$$R_A R_B R_C = \begin{bmatrix} cBcC & cBsC & -sB \\ sAsBcC - cAsC & sAsBsC + cAcC & sAcB \\ cAsBcC + sAsC & cAsBsC - sAcC & cAcB \end{bmatrix} \tag{5}$$

and equate $R_A R_B R_C$ to a given 3x3 ORTHO matrix:

$$ORTHO = \begin{bmatrix} g_{11} & g_{12} & g_{13} \\ g_{21} & g_{22} & g_{23} \\ g_{31} & g_{32} & g_{33} \end{bmatrix}, \tag{6}$$

from which it is clear that $sB = -g_{13}$. Since the definition of sB is $\sin(B\pi/180)$, we have $B = \sin^{-1}(-g_{13})*180/\pi = -\sin^{-1}(g_{13})*180/\pi$. Once B is known, we deduce from $cBsC = g_{12}$ that $\sin(C\pi/180) = sC = g_{12}/cB$ and thus $C = \sin^{-1}(g_{12}/cB)*180/\pi$. Similarly, from $sAcB = g_{23}$ we obtain $A = \sin^{-1}(g_{23}/cB)*180/\pi$.

For the ORTHO matrix of Day 2000-012, the above computation yields the following angles in degrees:

A = -0.140528
B = -0.712907
C = 0.410781

For the ORTHO matrix of Day 2000-231, the above computation yields:

A = -0.165668
B = -0.504179
C = 0.332906

In a theory treating ORTHO as a rotation matrix, each ORTHO matrix should be orthogonal; that is, the matrix product $(ORTHO)^T*ORTHO$ should equal I. Here T stands for matrix transpose and I = the 3x3 identity matrix. Now define the maximum error of orthogonality as the entry in $[(ORTHO)^T*ORTHO - I]$ with the maximum absolute value. This error is 0.018173 and 0.021248 for Days 2000-012 and 2000-231, respectively. Similarly, the maximum absolute value among the entries in the error matrix ($R_A R_B R_C$ - ORTHO) is 0.013507 and 0.010867 for Days 2000-012 and 2000-231, respectively. Thus, the angles A, B, and C computed above are fairly precise.

Table 2 combines the above computed angles A, B, and C with the angles from the first table in Section 4.9.1.2. This chart also contains the subsequently computed quantities necessary to determine to what extent calibration drift is present in the data and whether the calibration matrices compensate for such drift.

TABLE 2. A Study of Change in Calibration Rotation Angles							
	CT050	CT083	D	D/dd	CT116	D	D/dd
A	-0.011169	0.035353	0.046522	0.00141	0.036364	0.001011	0.000031
B	-0.067365	-0.003893	0.063472	0.001923	0.027024	0.030917	0.000937
C	0.001566	-0.011807	-0.01337	-0.00041	-0.015181	-0.00337	-0.000102
Total	0.068303	0.037475	-0.03083	-0.00093	0.047782	0.010307	0.000312

	CT149	D	D/dd	CT182	D	D/dd
A	0.138719	0.102355	0.003102	0.146984	0.008265	0.00025
B	0.021608	-0.00542	-0.00016	0.046335	0.024727	0.000749
C	0.074791	0.089972	0.002726	0.084324	0.009533	0.000289
Total	0.159071	0.111289	0.003372	0.175675	0.016604	0.000503

	CT215	D	D/dd	CA012	CA231	CalD	CalD/dd
A	0.070963	-0.07602	-0.0023	-0.14053	-0.16567	-0.02514	-0.00011
B	0.053667	0.007332	0.000222	-0.71291	-0.50418	0.208728	0.000953
C	0.035953	-0.04837	-0.00147	0.410781	0.332906	-0.07788	-0.00036
Total	0.095961	-0.07971	-0.00242	0.834704	0.626475	-0.20823	-0.00095

In the left-hand column of each section:

A = Angle A, in degrees
B = Angle B, in degrees
C = Angle C, in degrees
Total = sqrt($A^2 + B^2 + C^2$) only in columns headed by "CTxxx" or "CAxxx". In columns marked "D" and "CalD", "Total" is the difference between the current and previous values of sqrt($A^2 + B^2 + C^2$). In columns marked "D/dd" or "CalD/dd", "Total" is the value to the immediate left (in column "D" or "CalD") divided by number of days between measurements (33 for column "D/dd" or 219 for column "CalD/dd").

and in the top row of eachsection, for each angle (A, B, or C) and Total:

CTxxx = Continual Twist angle for Day 2000-xxx
D = Difference between angle of current and previous sample days. For example, the "D" that follows "CT116" is (Day-116 angle minus Day-083 angle).
D/dd = Average angle difference per day. Here "dd" = 33 days between successive samples.
CA012 = Continual Twist angle from ORTHO calibration matrix for Day 2000-012
CA231 = Continual Twist angle from ORTHO calibration matrix for Day 2000-231
CalD = (Day-231 calibration-matrix angle minus Day-012 calibration-matrix angle)
CalD/dd = Average angle difference per calibration day. Here "dd" = 231 - 012 = 219 days.

From the "D/dd" columns in the Table 2 above, the least-squares solution of Angle A rises almost steadily but falls at the end of the 165-day interval between the first and last sample days, averaging a gain of 0.002493 degrees per day. Angle B rises almost steadily but falls a bit in the

middle, with an average gain of 0.003671 degrees per day. Angle C and the total rotation angle rise in the middle and fall at the beginning and end, posting respective overall rises of only 0.001033 and 0.000838 degrees per day. From these figures it can be deduced that the angles tend to rise steadily, and each angle is greater at the end of the 165 days than at the beginning. This finding signals a drift in the calibration angles, especially in Angle B.

The angular changes in the ORTHO matrix are easily read from the "CalD/dd" column. In the ORTHO matrix for Day 2000-231, Angle A decreases by an average of 0.00011 degrees per day since Day 2000-012. Angle B increases by 0.000953 degrees per day, and Angle C falls by 0.00036 degrees per day. The total angle drops 0.00095 degrees per day, which is close to the 0.000838-degree daily rise of the total angle for the data days. Hence, the above analysis shows that the difference between the calibration matrices of Days 2000-012 and 2000-231 corrects for the perceived angular drift over the data days. However, the relative magnitudes of the angles in question, their inconsistent trending, and the limited number of samples may indicate that these results are in the noise.

3. OBSERVED PHENOMENA

This Section describes those phenomena that were noted in the data post-calibration.

Section 3.1 shows samples of calibrated data for quiet, active, and very quiet days and discusses the difference between their appearances. Section 3.2 addresses equipment-induced jumps in the magnetic field. Section 3.3 deals with the appearance of a significant wave in the Z-curve for some data days but not for others. Section 3.4 discusses a sawtooth wave in the X-curve. Section 3.5 investigates whether the remaining curves in the quiet measured-minus-modeled field are due to a constant time error resulting in out-of-phase magnetic fields. In Section 3.6, a study compares the modeled field and other results of current IGRF-2000 coefficients that have been used in APSM, with similar results from a new set of coefficient values based on measurements of the Ørsted satellite [*Olsen, et al.,* 2000].

3.1 Appearance Of Calibrated Data

This Section contains three sample plots of the calibrated data:

The plot that follows shows two orbits of quiet measured-minus-modeled data from a non-Z wave day, in all three dimensions, output range +/-1000nT. Hanging vertical ticks near the top of the box around each axis plot indicate ascending nodes of the satellite orbit.

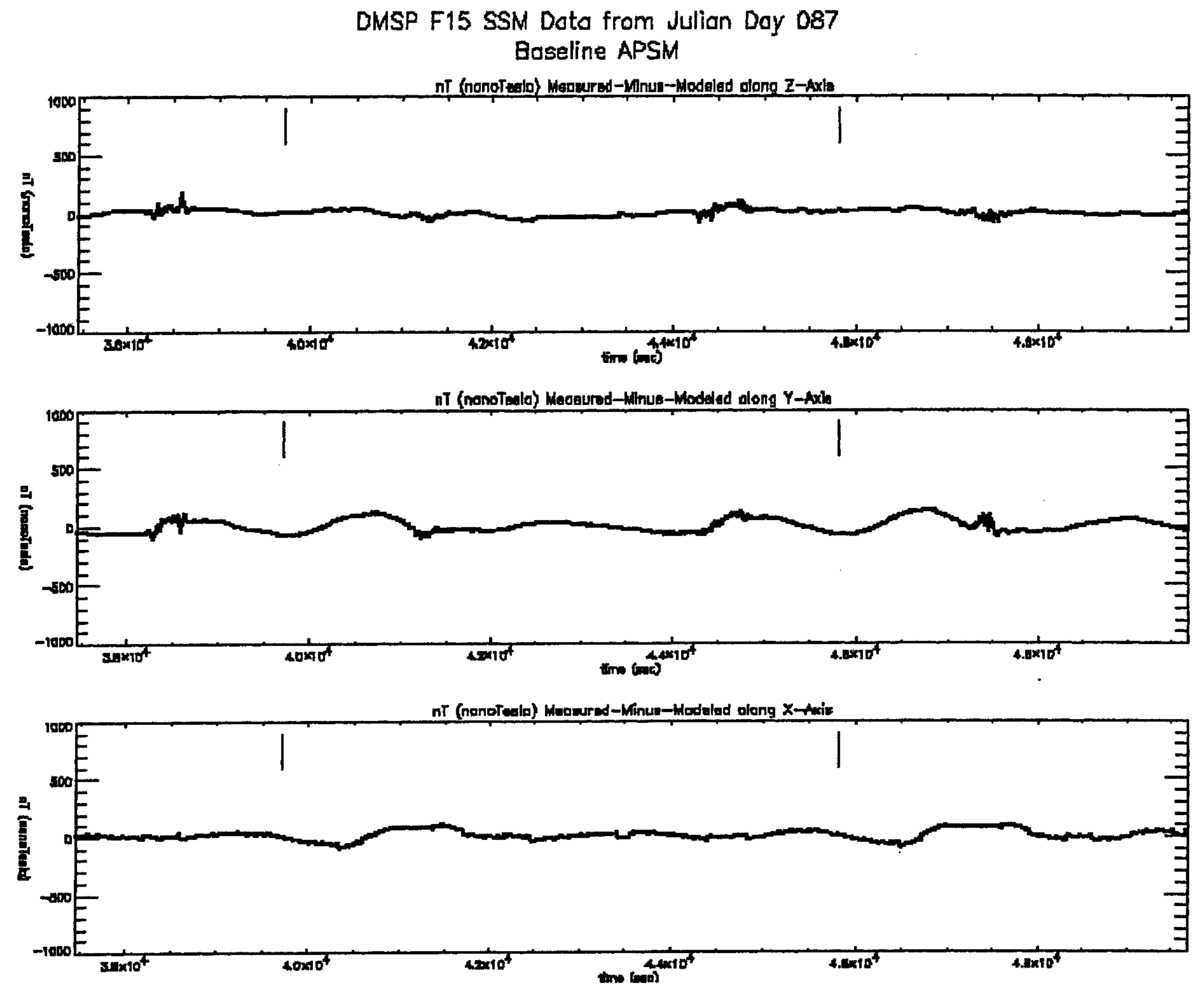


Figure 9. Quiet Day Calibrated Measured-Minus-Modeled Data.

Figure 10 shows two orbits of active measured-minus-modeled data from a non-Z wave day, all three dimensions, output range +/-1000nT for axes X and Y and +/-1300nT for the Z-axis to fit its curve. Hanging vertical ticks near the top of the box around each axis plot indicate ascending nodes of the satellite orbit.

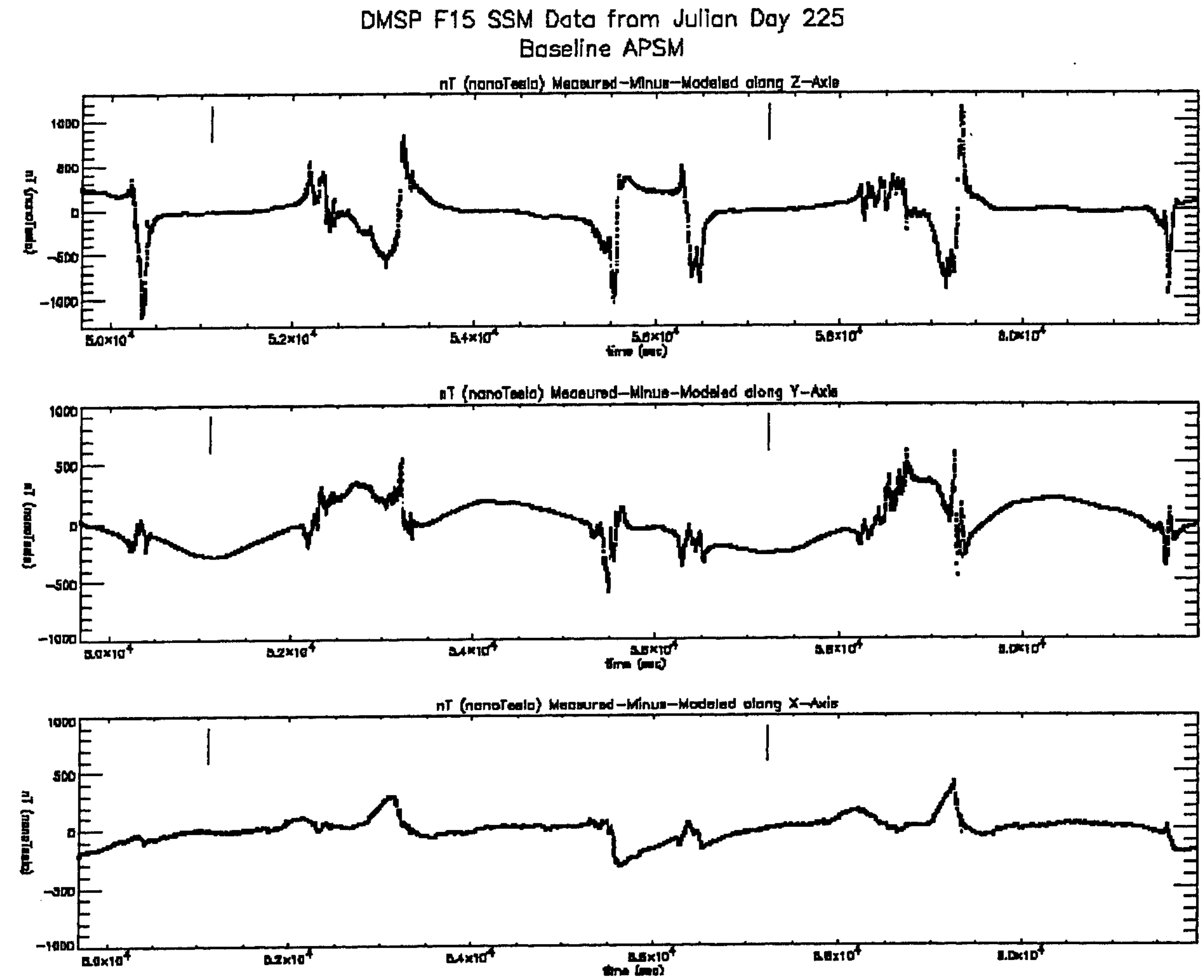


Figure 10. Active Day Calibrated Measured-Minus-Modeled Data.

The active plot from Day 2000-046 displays much more activity than does the quiet plot from Day 2000-032. This difference is most pronounced in the Z-curves and least noticeable in the X-curves. The disruptions appear in the auroral zones, whereas the curves in the non-auroral regions remain smooth.

Figure 11 shows four orbits of very quiet measured-minus-modeled data from a non-Z wave day, all three dimensions, output range minimal. Hanging vertical ticks near the top of the box around each axis plot indicate ascending nodes of the satellite orbit.

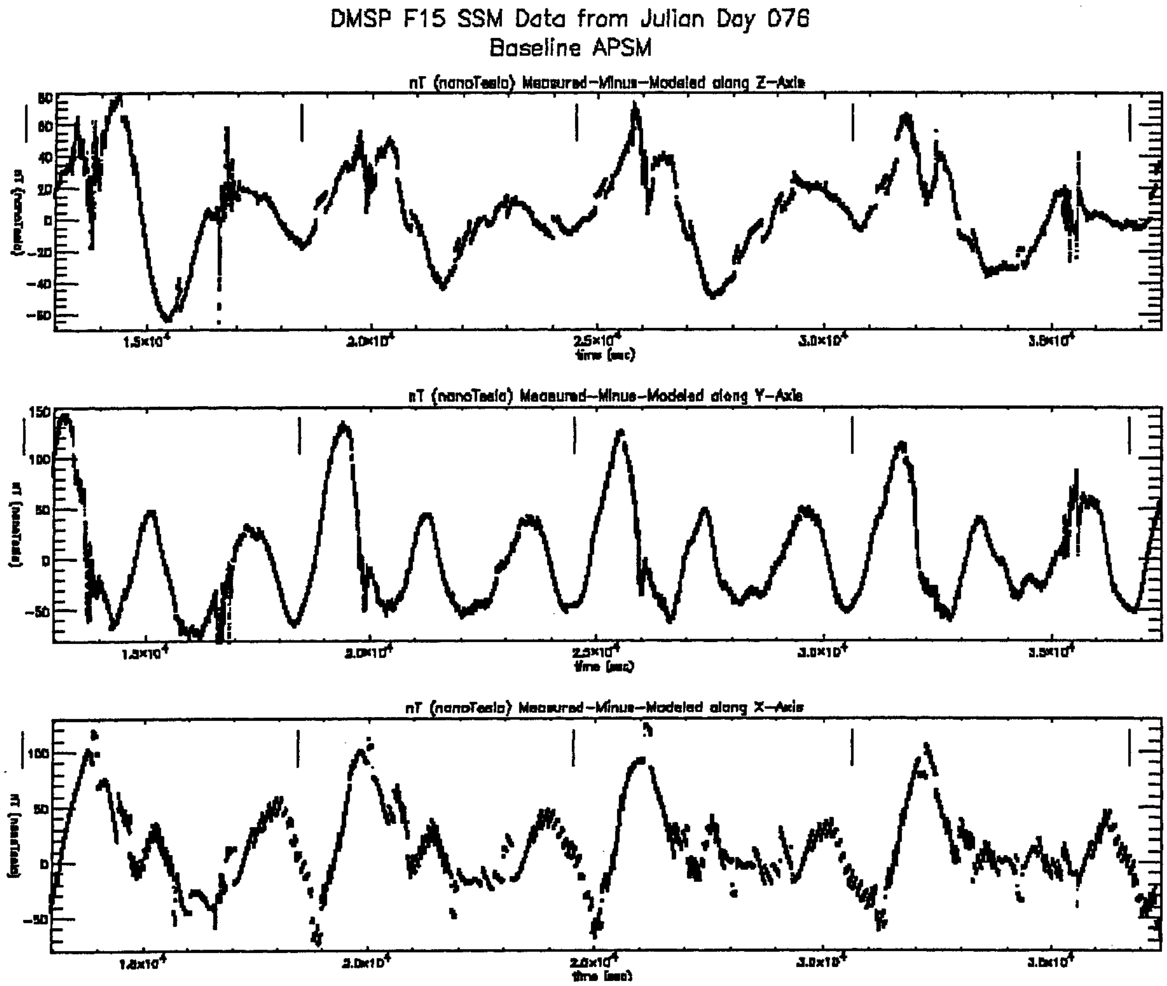


Figure 11. Remaining Difference in the Measured-Minus-Modeled Field.

The last plot in Figure 11 contains four orbits of very quiet data from Day 2000-076. This plot appears noisier than the other two, since it is magnified about 8 times relative to the other two. This magnification shows the sinusoidal waves still present in this plot. Most sinusoids are contained in the ranges of:

-80 to 130 nT for the X-axis
-80 to 150 nT for the Y-axis
-80 to 80 nT for the Z-axis

3.2 Remaining Equipment Operation Induced Step Field Jumps

While the movement of the sensor from body-mounting to the end of a 5m boom greatly reduced the number of equipment operation induced step field jumps in the data, a few remain. In the X (down) axis, 30nT jumps of duration 150-450 seconds can be seen, with similar 10nT jumps visible in the Z(orbit normal). These jumps appear infrequently or typically two to four times per orbit. These artifacts are not removed because any removal algorithm would be likely to also remove portions of auroral activity.

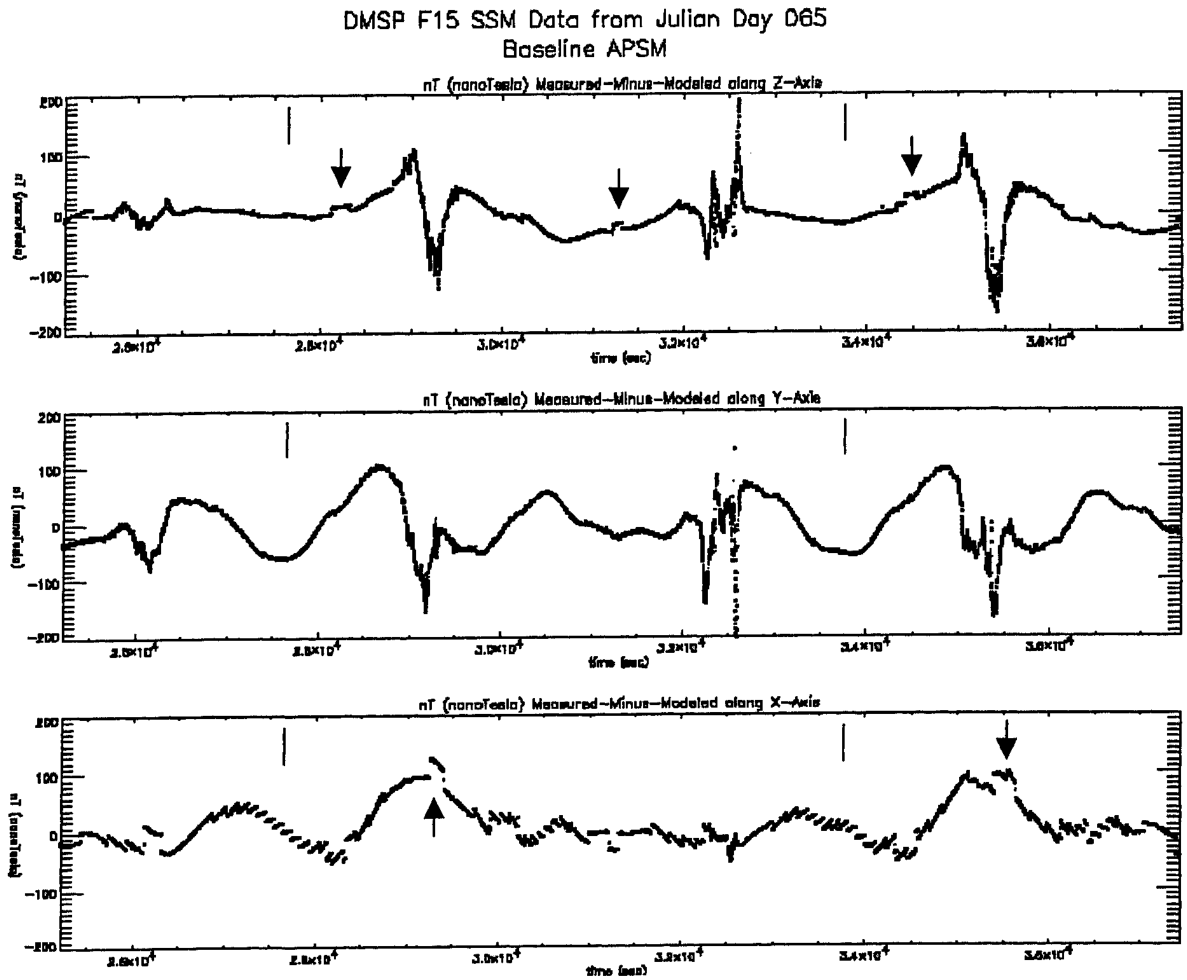


Figure 12. Remaining Equipment Operation Induced Step Field Jumps.

The vertical lines hanging just below the top of each chart box indicate time of the ascending node.

3.3 Sinusoid In The Orbit Normal (Z) Dimension

The curves for Days 2000-005, 2000-008, 2000-010, 2000-016, 2000-017, 2000-018, 2000-021, 2000-031, 2000-047, 2000-136, and 2000-163 exhibit a sine wave in the Z-dimension. For most days the average period of a Z-wave is 3060 seconds, but for Days 2000-005, 2000-136, and 2000-163 it is 3170, 3070, and 3050, respectively. Thus each period lasts approximately half an orbit.

However, in the last part of Days 2000-047 and 2000-136, the wave suddenly flattens out at T=57600 and T=67600, respectively. Hence it is, in general, very easy to remove mathematically, but for Days 2000-047 and 2000-136 its removal is somewhat harder.

3.3.1 Most Wavy-Flat Boundaries Are Sudden

In most cases the Z-wave undergoes a sudden change when crossing midnight UT. However, exceptions occur in "adjacent-to-wavy" Days 2000-004, 2000-011, 2000-015, 2000-030, 2000-046, 2000-048, 2000-135, and 137, of which the last four correspond to the anomalous wavy days 047 and 136. Even with these exceptions, the correspondence of the boundaries of the wave amplitudes to the boundaries of the data files is cause for concern.

Table 3 lists the behavior of the wave between each "wavy" day listed in Section 3.3 above and the days adjacent to it. All days are from the year 2000.

TABLE 3. Transition Behavior of the Z-Wave Across Day/File Boundaries		
Wavy Day	Day Before	Day After
005	004 is wavy like 005	wave suddenly disappears when it crosses from 005 to 006
008	wave suddenly appears when it crosses from 007 to 008	wave suddenly shrinks in amplitude when it crosses from 008 to 009
010	wave suddenly grows in amplitude when it crosses from 009 to 010	011 starts with data gap until UT=11,800, when a flat Z-curve appears
016	large data gap at the end of 015, wave reappears in full strength at start of 016	(017 is also wavy)
017	(016 is also wavy)	(018 is also wavy)
018	(017 is also wavy)	wave suddenly shrinks in amplitude when it crosses from 018 to 019
021	wave suddenly grows when from 020 to 021	wave suddenly shrinks from 021 to 022
031	wave GRADUALLY grows from 030 to 031	wave suddenly shrinks from 031 to 032
047	wave suddenly appears as choppy at UT=70,000 of Day 046, then becomes smooth (but amplitude remains large) when it enters 047. Through 047, wave steadily grows in amplitude until it suddenly becomes flat at UT=57,600.	wave suddenly loses its flatness from 047 to 048
136	wave is flat until UT=71,500 of Day 135, wave gains amplitude. At Day 136, UT=67,600, wave suddenly becomes flat again.	wave stays flat through 137
163	wave suddenly appears when it crosses from 162 to 163	wave suddenly disappears when it crosses from 163 to 164

The plot in Figure 13 depicts the last two orbits of Day 2000-031 and the first two orbits of 2000-032, both of which show Z-waves. The Z-wave undergoes a sudden shrinkage from a total height of about 315nT on Day 2000-031 to only 160nT on Day 2000-032, where the total height is the average distance in nT from the peak of a wave to its bottom. The plot shows that the total height gradually settles down in the interval from 86400 and 88600 seconds UT, or 2200 seconds into Day 2000-032, to the smaller wave of 2000-032.

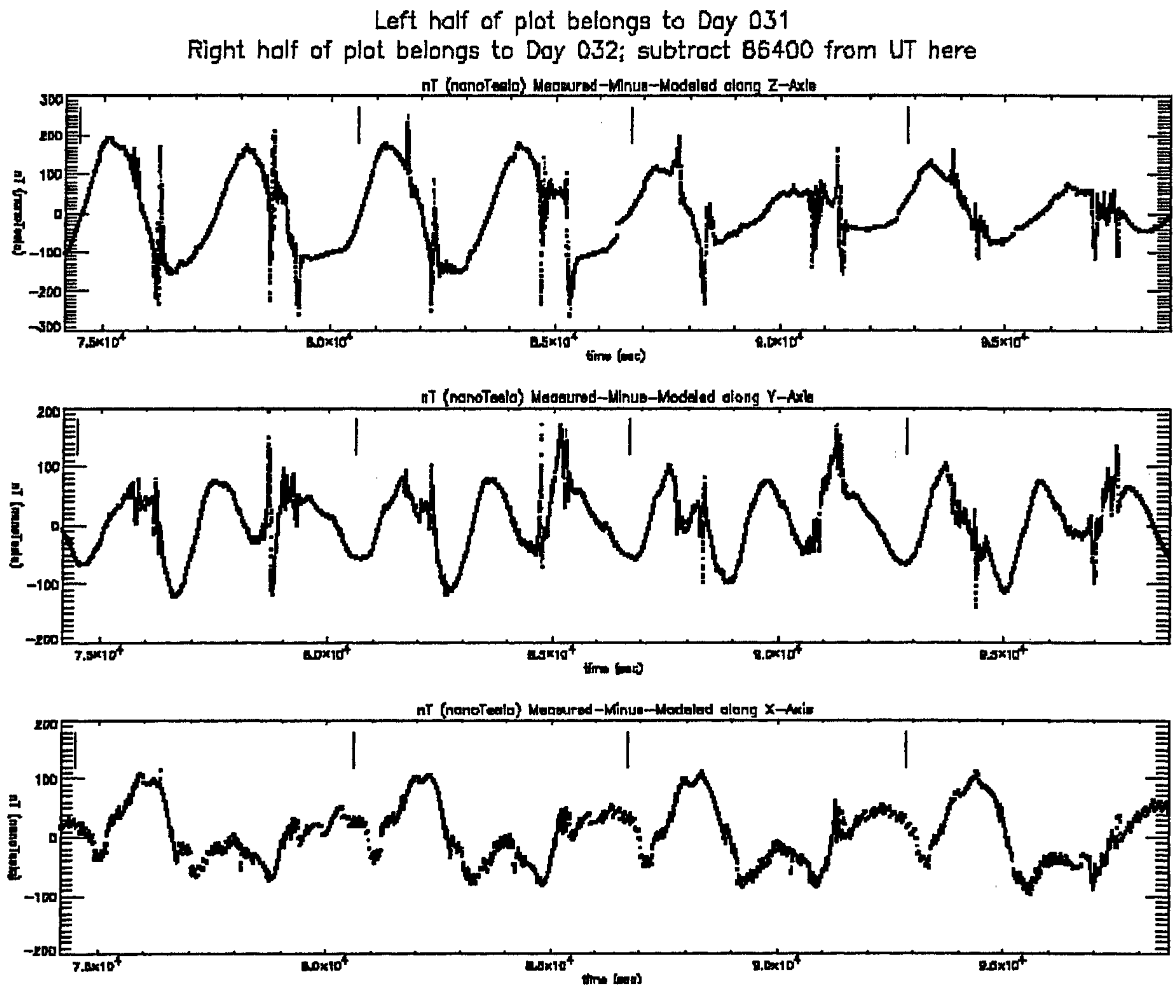


Figure 13. The Z-Wave Crossing Midnight.

3.3.2 Relationship Between Z and X/Y

As with the Z axis, sinusoidal waves can be observed in the X and Y axes.

For each wavy day, the average peak amplitude is tabulated in Table 4, estimated to the nearest 10 nT. Those about halfway between two 10's of nT are listed to the nearest 5 nT. In addition, the average magnitudes of the wave trough (bottom of curve) and crest (curve top) are listed, thus portraying the average vertical wave shift from 0 nT. The peak amplitudes of the X and Y curves are added below.

TABLE 4. Comparative Wave Amplitudes in Z vs. X & Y					
Day	Z Avg. peak	Z Avg. min	Z Avg. max	X Avg. peak	Y Avg. peak
005-2000	280	-290	260	60	95
008-2000	250	-260	240	60	85
010-2000	235	-240	230	55	90
016-2000	270	-280	265	60	90
017-2000	150	-150	150	55	80
018-2000	160	-160	160	55	80
021-2000	165	-160	170	60	75
031-2000	160	-160	160	60	80
047-2000	300	-250	340	60	85
136-2000	155	-110	240	70	105
163-2000	150	-140	160	40	80

For a set of sample days, the Y-wave has much less amplitude than the Z-wave, and is always 1.5 times as frequent as the Z-wave. Moreover, waves Y and Z are 90 degrees out of phase except in Day 136, in which they are in phase or 180 degrees out of phase. At the vertical lines that mark the ascending nodes (crossing the equator going north), the Y-wave always hits a minimum. Here the Z-wave is halfway up its rise, except that it is halfway down its drop on Days 046 and 047 and at its minimum on Day 136.

The amplitude of the X-wave is so small that its peaks are hard to discern. However, its frequency equals that of the Y-wave. The X-wave lags a bit behind the Y-wave, since at the ascending nodes where the Y-wave hits a minimum, the X-wave has almost reached its minimum.

The amplitudes of the waves X and Y are just as high for the non-wave days as they are for the wavy days. Thus the amplitudes for X and Y are independent of the Z-amplitude. Based on these observations, it is believed that the effects of the Z-wave are limited to that axis, and the sinusoids in the X and Y are unrelated.

3.3.3 X and Y Waves Are Not Created by Calibration

For each of the above days, the contribution of the calibration matrices from the Z-axis to axes X and Y is defined as the first two components of the 3x1 vector:

$$ORTHO * \begin{bmatrix} 0 \\ 0 \\ Z \end{bmatrix} = \begin{bmatrix} ORTHO(1,1) & ORTHO(1,2) & ORTHO(1,3) \\ ORTHO(2,1) & ORTHO(2,2) & ORTHO(2,3) \\ ORTHO(3,1) & ORTHO(3,2) & ORTHO(3,3) \end{bmatrix} * \begin{bmatrix} 0 \\ 0 \\ Z \end{bmatrix} = \begin{bmatrix} ORTHO(1,3) * Z \\ ORTHO(2,3) * Z \\ ORTHO(3,3) * Z \end{bmatrix} \quad (7)$$

where Z = average maximum amplitude of Z-wave, in nT. Thus, the X and Y contributions are respectively ORTHO(1,3)*Z and ORTHO(2,3)*Z. Since ORTHO is very close to the identity matrix, the contributions from Z to X and Y are very small compared to the actual observed peaks in the X and Y axes. Similarly, the ORTHO matrix for non-auroral points is also close to the identity matrix and thus, its contributions are also small. We can conclude that the X and Y waves are NOT due to calibration matrices.

3.4 Sawtooth In The Down (X) Dimension

The X-curve contains frequent regions of sawteeth phenomena overlaying the measured-minus-modeled field curves in all 28 days of sample data examined. These sawteeth are noticeable as a series of parallel lines and are often aligned perpendicular to the flow of the curve. Close examination shows these lines to be the result of a series of the following pattern: gradual linear increases in the measured-minus-modeled field, followed by a discontinuity where the field drops back to a baseline and begins to ramp up again.

NOTE: Even the Sections without "sawteeth" are NOT composed of one continuous curve. They also have sawteeth, except theirs are much longer, less regular in period and amplitude, and run along the curve flow. The discontinuities between long sawteeth are real, since the MFR files show discontinuities in the X-field at these breaks. Thus, the long sawteeth are a mathematical fact. Moreover, the long sawteeth are regular sawteeth, although the X-curve exhibits other discontinuities.

Subsections 3.4.1 through 3.4.6 are limited to short sawteeth.

The following plot, in Figure 14, of the X-curve of Day 004-2000 shows a typical series of sawteeth.

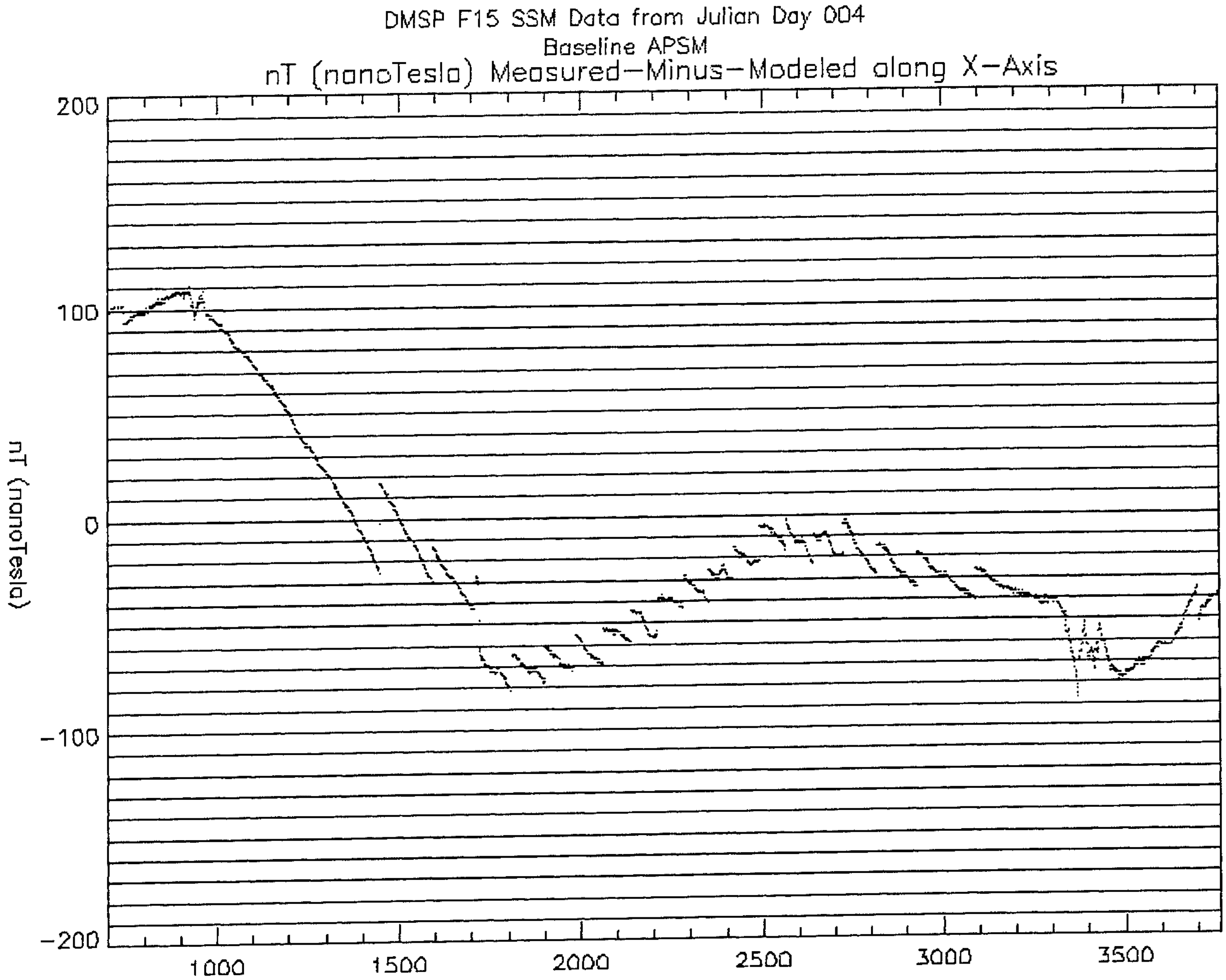


Figure 14. The X Sawtooth.

3.4.1 Height of the X-Sawtooth Phenomena

The amplitude range or height of the discontinuity of an average-sized sawtooth is about 12 nT. However, this height varies widely from one sawtooth to another. Over the 28 sample days, the discontinuity ranges from indiscernible to 30 nT. Such a sawtooth with amplitude 30nT was found at UT=54500 on Day 2000-010.

3.4.2 Period of the X-Sawtooth Phenomena

The average period or duration of a sawtooth cycle is about 100 seconds, although this period is only 70 to 80 seconds on some segments of the curve.

Areas of high-period or spaced far apart, low-amplitude sawteeth appear in the middle of some short-curve zones. These zones are more likely to span over long time intervals (such as 1500 seconds) as opposed to short intervals (700 seconds), and to span larger ranges of amplitude,

than other zones. In addition, the high-period, low-amplitude sawteeth are more likely to appear within 5 degrees of the equator than are the surrounding sawteeth, and are less regular and far less frequent.

3.4.3 Latitudinal Distribution of the X-Sawtooth Phenomena

About 55 percent of the X measured-minus-modeled curve lies in the sawtooth region, which corresponds to the latitudes shown in Table 5. These latitudes are derived from Seconds 0-20000 UT of sample days 2000-004 and 2000-047, and Seconds 48000-68000 of sample day 2000-163.

TABLE 5. Latitudinal Distribution of the X-Sawtooth

Day	Number of sample region	Geographic latitude (deg N)		Magnetic latitude (deg N)	
		Starting	Ending	Starting	Ending
2000-004	1	37	-40	30	-53
	2	-54	32	-40	44
	3	38	-40	32	-53
	4	-77	33	-61	43
	5	38	-34	32	-45
	6	-56	37	-43	42
2000-047	7	53	-44	46	-58
	8	-70	30	-55	42
	9	38	-44	32	-56
	10	-47	29	-32	39
	11	54	-40	49	-49
	12	-44	31	-35	36
2000-163	13	-36	39	-48	32
	14	44	-70	54	-58
	15	-30	37	-42	32
	16	-24	35	-35	29
	17	-45	33	-52	26

Each of the 17 regions charted above crosses the equator, spanning typically between -45 and 45 degrees N, for both geographic and magnetic latitudes. Thus, the sawteeth seem to occur in the non-auroral regions of the satellite orbit. Except for region 16, the satellite direction alternates between northbound and southbound.

3.4.4 Sawteeth Cross Day and File Boundaries

There are plenty of examples of sawteeth crossing between files (i.e. two consecutive days):

- Days 005-006 (the 2 stripes on the 005 side at 0-20 nT continue on the 006 side with 1 stripe at 0-10 nT, before abrupt drop to -30 nT that begins a zone of many stripes)
- Days 006-007
- Days 009-010

- Days 016-017
- Days 020-021
- Days 021-022
- Days 030-031 (with abrupt rise of 25 nT from 030 side to 031 side)
- Days 031-032
- Days 046-047 (the stripes here are very short in length)
- Days 136-137 (only 2 stripes appear on the 136 side; they average 15 nT above the next few stripes on the 137 side)

No examples of sawteeth beginning on one side of midnight UT and ceasing at the day/file boundary were observed.

3.4.5 Sawteeth in the Z-Curve, but Not the Y-Curve

Close-up plots of the Y-curve do NOT reveal any sawteeth. However, close-ups of the Z-curve do reveal telltale parallel lines in some places, but not nearly as often as on the X-curve. Nor are the several consecutive "teeth" that conclusively demonstrate the artificiality of the X-sawteeth visible.

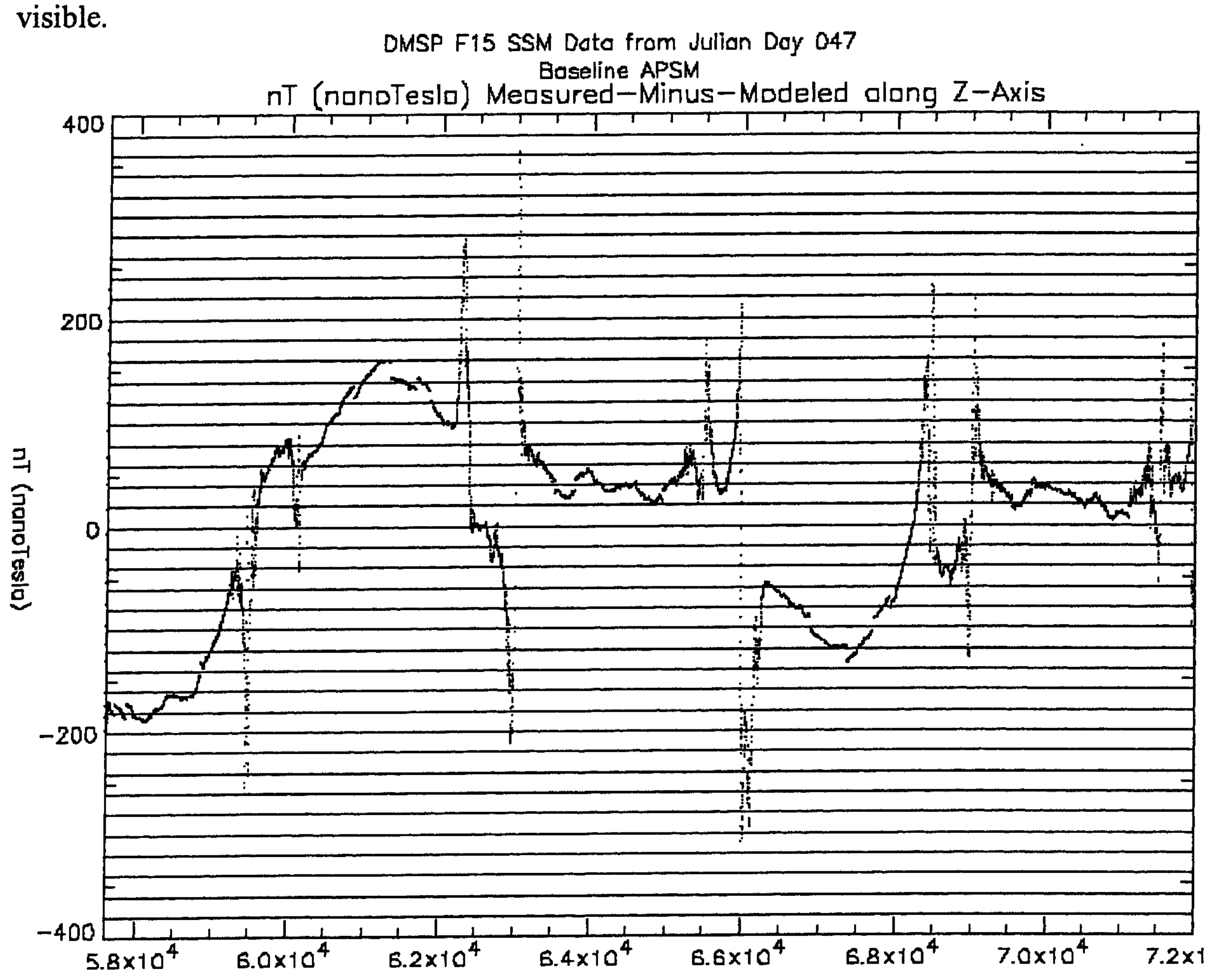


Figure 15. Some Sawteeth in the Z Curve.

These 3 parallel lines, which do NOT continue onto the previous plot, are real sawteeth. Their amplitudes average 14nT and their periods 114 seconds. During their 341sec interval from 57,631sec UT to 57,972sec UT, the geographic latitude of the satellite drops from approximately 22.6deg N to 2.6deg N, and its magnetic latitude from 32.3deg N to 11.1deg N. Although they do not correspond to any sawtooth effect in the X-axis, they form the largest number of consecutive short sawteeth in a sample collection of Z-curve plots for Days 004-2000, 047-2000, and 163-2000. However, these three days contain numerous examples of long "sawteeth".

3.5 Time-Phase Calibration Study

This study investigates whether the remaining curves in the quiet measured-minus-modeled field are due to a constant time error resulting in out-of-phase magnetic fields.

The TLEs provide the track of the spacecraft, the series of its positions over time. For each position, the modeled field is calculable. However, if there is an error in the time of the orbit or in the time with which the measurements are tagged, the cumulative error means that while the measured and modeled fields are correct, they are correct for two different times. Comparison of these two out-of-phase fields results in an error, a measured-minus-modeled (MMM) field difference. Hence not only would the in-flight calibration not calibrate (correct) for such an error, but also that error would bias, and limit the ability of, the calibration to correct for the error it is designed to fix (gain, cross-talk, and change in model field). Examinations of the calibrated MMM data have shown periodic errors that are approximately in the range that a 1.0-second phase error between the measured and modeled field might cause.

SSM calibration depends on making a best fit of measured magnetic field to modeled field. This best fit depends not only on the size of their resulting MMM difference, but also on the number and amplitudes of periodic functions in the MMM field. The smaller these quantities, the more easily these functions can be removed, thereby revealing the source and amount of error.

A metric of these quantities is the average of the absolute value of the MMM value, abbreviated AAVMMM, both overall (Magnitude) and in each dimension (X, Y, and Z). While it is hoped that any improvements in the "flatness" of the MMM field will be graphically evident, this numerical metric is useful to indicate whether an attempted phase correction marginally improves the quality of the MMM field. If no constant phase correction could be found, this metric would be useful to ensure that the search was complete rather than missing a potentially effective correction value. For a given day, the optimal time correction has the smallest maximal peaks of the MMM plot and the lowest Magnitude AAVMMM. Similarly, the optimal correction for the X-dimension has the lowest X-value of AAVMMM and preferably the smallest maximal peaks in the X-axis. The same holds true for the Y-dimension and for the Z-dimension.

3.5.1 Method

For a given period of data, the time for which the model field is calculated is varied by a constant value. This change has the affect of calculating a model field for earlier or later in the orbit. The measured-minus-modeled field is then examined to determine whether this phase shift in the model field has caused it to align with the measured field. Since the issue in question limits the existing calibration, a new calibration must be performed on each of the phase-shifted results to truly see whether the induced phase shift has resulted in an improvement or not.

For a given day, starting with a zero correction (T=0), different values of the correction T are used until a value of T with minimum Magnitude AAVMMM is arrived at. Each value of T is added to or subtracted from the time variable TTIME passed from Subroutine APSM_READ_RAW_CONVERT_TO_MEAS to Subroutine APSM_CREPH. For example, for T = -0.5, the last line before the call to APSM_CREPH is set to:

```
TTIME = TTIME - 0.5
```

Day 2000-076 from times 12300 to 42900 seconds UT has been chosen, being a very quiet span of a very quiet day, and thus, free of factors that could disturb the experiment. This time span covers exactly five orbits based on an average orbit length of 6120 seconds. Five orbits are enough to see the cyclical errors in MMM without introducing date-dependent issues. The extremely quiet data and the integer number of orbits preclude latitudinal bias. Care taken that no TLE lies inside this span, so that if there is an ephemeris time error, it has a better chance of remaining constant over the period studied.

3.5.2 Results

For Day 2000-076, Table 6 lists the correction values T and the Magnitude, X, Y, and Z values of AAVMMM for each T. It is noteworthy that the post-recalibration plots vary little in appearance with the value of T. In fact, the plots for T between 0.75 and 1.0 are nearly indistinguishable. Thus, the AAVMMM, but not the curve shape, is used.

TABLE 6. Results of Attempted Correction of Hypothetical Time-Phase Error				
T (sec)	AAVMMM values (nT)			
	Magnitude	X	Y	Z
-100.0	776.12	415.05	497.43	203.88
-20.0	170.80	88.04	116.31	43.01
-10.0	103.74	50.71	73.99	25.31
-4.0	70.05	31.03	51.92	17.62
-3.0	65.53	28.28	48.72	16.89
-2.0	61.57	25.94	45.75	16.41
-1.5	59.85	25.03	44.35	16.26
-1.0	58.34	24.39	43.03	16.15
-0.5	57.06	24.11	41.84	16.11
0.0	56.09	24.13	40.80	16.12
0.5	55.45	24.40	39.91	16.18
0.75	55.30	24.64	39.56	16.24
0.85	55.28	24.75	39.44	16.27
0.9	55.27	24.82	39.38	16.28
0.95	55.28	24.88	39.34	16.30
1.0	55.29	24.95	39.30	16.32
1.1	55.32	25.10	39.25	16.35
1.5	55.68	25.78	39.22	16.55
2.0	56.56	26.82	39.43	16.86
3.0	59.34	29.34	40.61	17.61
4.0	63.00	32.21	42.26	18.60
10.0	94.33	52.50	58.62	26.93
20.0	161.17	90.15	98.06	44.86
100.0	764.51	417.32	474.04	208.75

This table indicates that the optimal correction for the Magnitude AAVMMM is T=0.9. In fact, the trend in the above results for high values of T show that T=0.9 is the only optimal value.

As an example of the effect of the optimal correction on the MMM, the plots shown in Figures 16 and 17 contrast the Y-curve of the MMM at T=0 (Figure 16) to the Y-curve at T=1.4 (Figure 17) where the Y-axis AAVMMM is lowest.

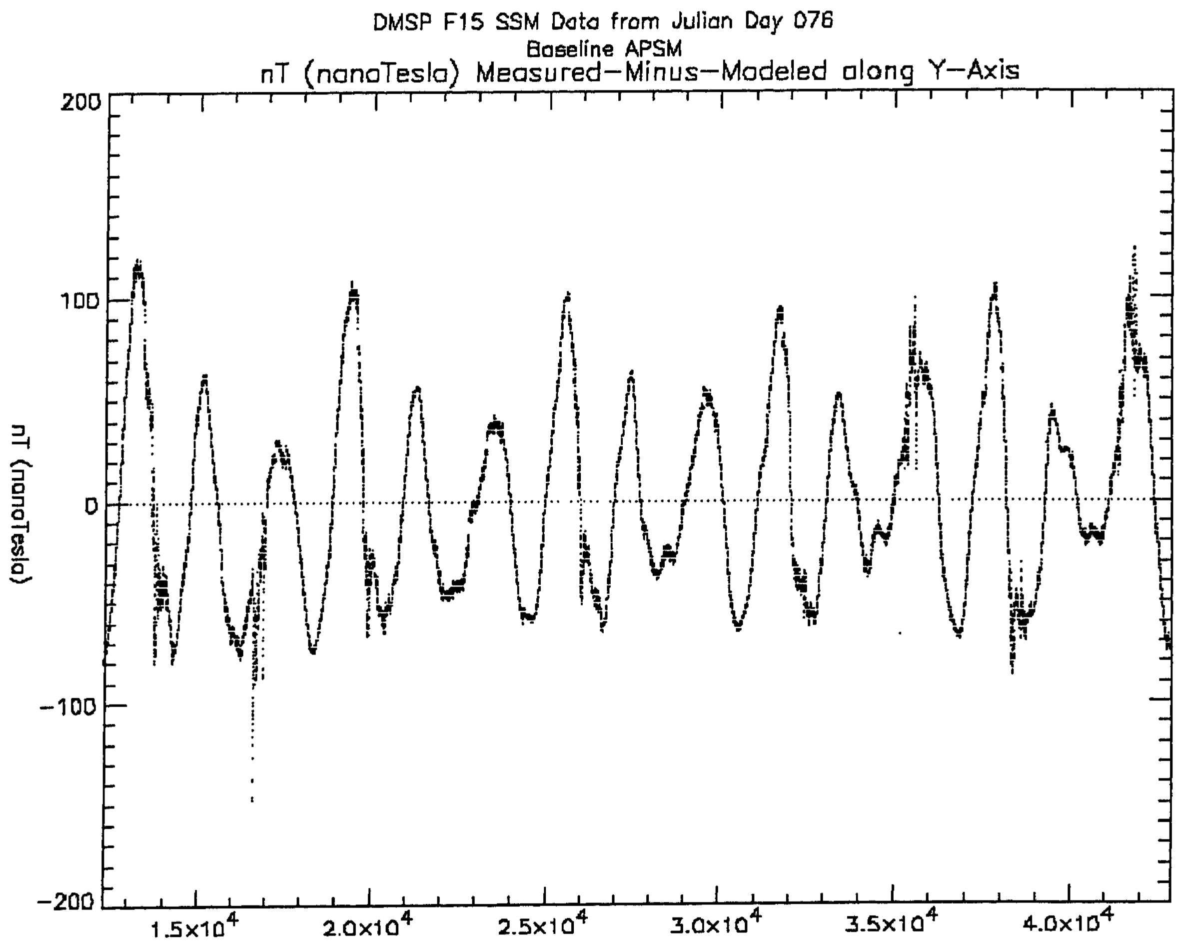


Figure 16. Y-Curve Without Corrective Time-Phase Shift.

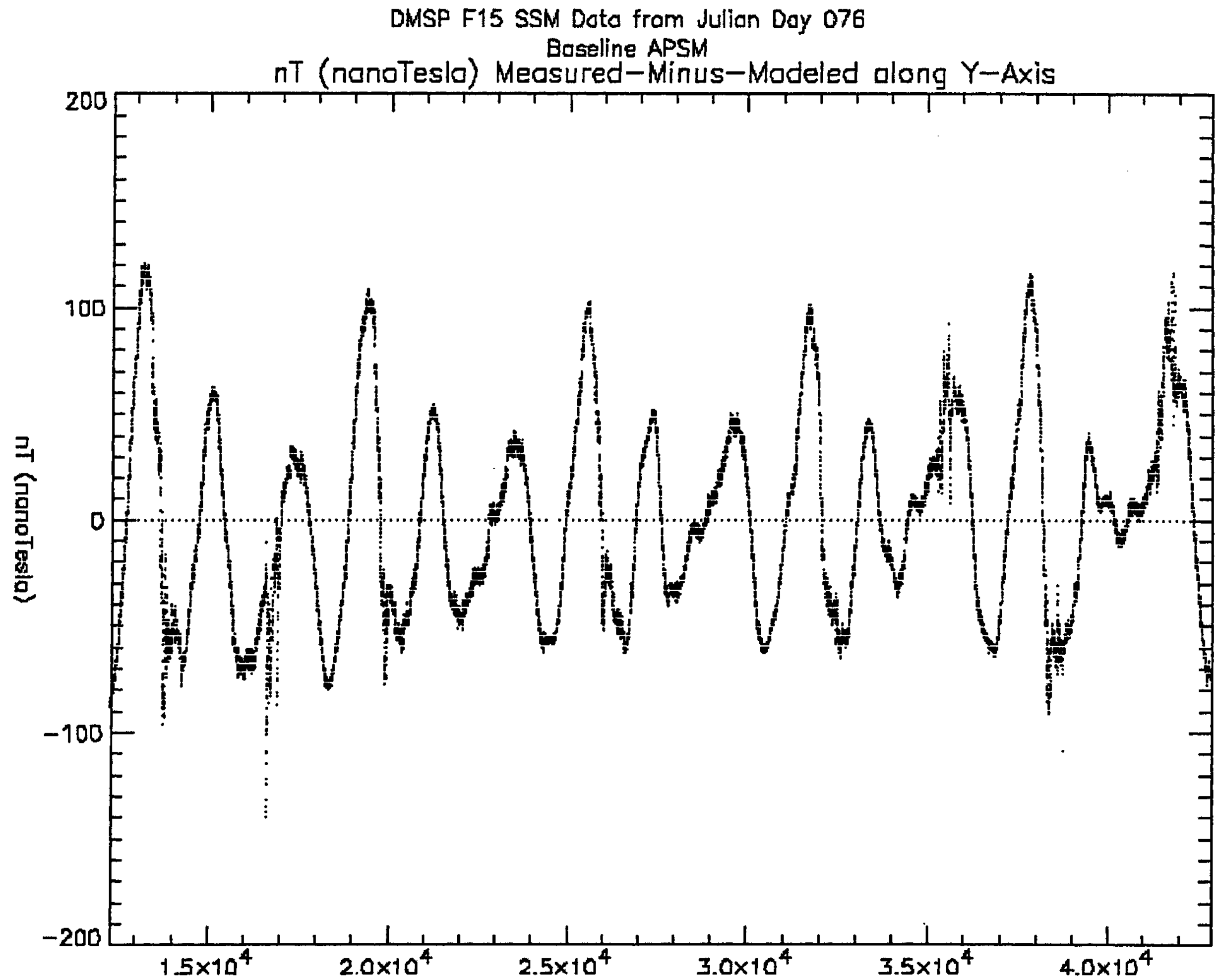


Figure 17. Y Curve with Best Corrective Time-Phase Shift.

Both curves look similar, but contrary to expectation, the largest peaks in the plot for T=1.4 are in general slightly *bigger* than those of T= 0. This effect underscores the unreliability of optimizing T based on the largest peaks in the plot.

It was hoped that finding this T would reduce the Magnitude AAVMMM enough and/or remove one of the periodic functions of error, making it easier for the remaining functions to be removed. However, this time correction does not bring the Magnitude AAVMMM close to zero. Moreover, the minimum Magnitude AAVMMM of 55.27 is not much less than for the time corrections immediately around it. This finding (together with the nearly unchanging appearance of curves near T=0.9) reveals that still other errors remain, perhaps never to be corrected, and suggests that a time correction is NOT the proper solution. Its cause is that even for the optimal T=0.9 that brings the measured and modeled curves closest together, their exact shapes are different enough to keep the Magnitude AAVMMM up at 55.27. Similarly, for the individual components X, Y, and Z, the lowest amounts of AAVMMM are approximately 24, 39, and 16,

respectively, indicating that the Z-error is less than the errors of X and Y. These minimums occur at T = -0.325, 1.4, and -0.325, respectively.

Whereas the time-error analysis of Day 2000-076 is started using the definitive early calibration, the analysis of Days 2000-164 and 2000-221 are started with the definitive late calibration. It was hoped that the correction T=0.9 would be the same for Day 2000-164. However, the minimum Magnitude AAVMMM error occurs at T=1.15, not 0.9. Similarly, for Day 2000-221 the minimum Magnitude AAVMMM is T=1.425. Thus, the solution T=0.9 does not seem to generalize to other days; each day has its own optimal correction time.

The shift in minimum Magnitude AAVMMM from T=0.9 on Day 2000-076 to T=1.15 on Day 2000-164 is 1.15-0.9=0.25. Since the AAVMMM minimums for X, Y, and Z on Day 2000-164 are 0.05, 1.825, and 0.025, respectively, their shifts are 0.375, 0.425, and 0.35, respectively. Thus, the Magnitude-AAVMMM shift of 0.25 does NOT hold for the AAVMMM minimums X, Y, and Z. Similarly, the AAVMMM minimums for X, Y, and Z on Day 2000-221 are 0.15, 1.9, and -0.125, respectively. Therefore, the shifts in minimum AAVMMM from Day 2000-076 to Day 2000-221 are 0.475, 0.5, 0.2, and 0.525 for X, Y, Z, and overall Magnitude, respectively, and are thus unequal.

Moreover, no pattern of results is readily visible that is consistent across the three days 2000-076, 2000-164, and 2000-221, making it difficult to track and remove the proper amount of time error across many days of data. All results for the above three sample days are tabulated in Tables 7 and 8. Furthermore, the day , 2000-164, and 2000-221 "best" correction times still had little impact upon the measured-minus-modeled field.

TABLE 7. Best Corrective Time-Phase Shifts for Various Days and Dimensions

Day Number	Optimal Correction Times (sec)			
	X	Y	Z	Magnitude
2000-076	-0.325	1.4	-0.325	0.9
2000-164	0.05	1.825	0.025	1.15
2000-221	0.15	1.9	-0.125	1.425

TABLE 8. Comparison of Best Corrective Time-Phase Shifts

Day Number	Shifts (sec)			
	X	Y	Z	Magnitude
2000-164	0.375	0.425	0.35	0.25
2000-221	0.475	0.5	0.2	0.525

3.5.3 Conclusions

Examinations of the calibrated MMM data have shown periodic errors that are approximately in the range that a 1.0-second phase error between the measured and modeled field might cause.

For Day 2000-076, and most likely in general, the optimal correction T does not bring AAVMMM close to zero. In addition, the minimum AAVMMM is not much less than for the time corrections immediately around it. Moreover, when T is near the optimal value, the curves vary little with T. All of the findings in this paragraph reveal that still other errors remain, perhaps never to be corrected, and suggest that a time correction is NOT the proper solution.

Each of the three sample data days 2000-076, 2000-164, and 2000-221 has a unique optimal correction time T for each value (X, Y, Z, Magnitude) of AAVMMM. However, these times vary from one day to another. In addition, no pattern of results is readily visible that is consistent across the three days, making it difficult to track and remove the proper amount of time error across many days of data.

3.6 IGRF Versus Ørsted Coefficients

The Danish satellite, Ørsted, was launched on 02/23/1999. The main goal of its mission is to accurately map the magnetic field of the Earth. Magnetic field model coefficients were proposed based on the Ørsted measurements [*Olsen, et al.,* 2000].

This study compares the modeled field and other results of current IGRF-2000 coefficients that have been used in APSM, with similar results of a new set of field coefficients derived from Ørsted data, as reported in *Olsen, et al.* [2000]. Each set of coefficients is the spherical harmonic coefficients for the internal magnetic field of the Earth. The change in coefficients significantly affects the MMM field and calibration-correction matrices, but not the modeled field and AAVMMM values. AAVMMM is defined above in Section 3.5.

The above results are consistent with *Olsen, et al.* [2000], Page 3609, which indicates that the difference in the IGRF-2000 and Ørsted models of secular variation (SV) of the field is negligible.

3.6.1 Method

The IGRF and Ørsted models were run through APSM for Day 2000-006. This day was picked as a quiet day close to January 1, 2000 for which little data is missing. Closeness to January 1 is needed since the analysis in the Ørsted article does not include dB/dt coefficients, but calculates the field coefficients based on a "snapshot" of the modeled field near January 1.

For each run of APSM, the correct set of coefficients was loaded into arrays G and GT of the INCLUDE file APSM_IGRF_2000.INC. Here the array G contains the coefficients for the modeled field, while GT represents the change in modeled field with respect to time. The letter

"T" in "GT" stands for "Time derivative." The template needed to rearrange the Ørsted coefficients into APSM_IGRF_2000.INC is derived from *NOAA* [1999].

3.6.2 Results

The calibration-correction matrices from the early calibration to T_0 and AAVMMM values from the T_0-calibrated run are listed below for IGRF and Ørsted. Their (Ørsted - IGRF) differences are also computed here. The matrices and table in Section 3.6.4 below and the two GIF images "mod_orst.gif" and "mmm_orst.gif" show that the change in coefficients has little effect on the modeled field and AAVMMM values. The images in Figures 18 and 19 show the difference between the two modeled fields (Ørsted - IGRF) and the two MMM fields (Ørsted - IGRF), respectively.

These results agree with *Olsen, et al.* [2000], Page 3609, which indicates that the difference in the IGRF-2000 and Ørsted models of secular variation (SV) of the field is negligible.

However, the above change affects the calibration-correction matrices, and the MMM field. This effect is not much smaller than the magnitude of the MMM field itself.

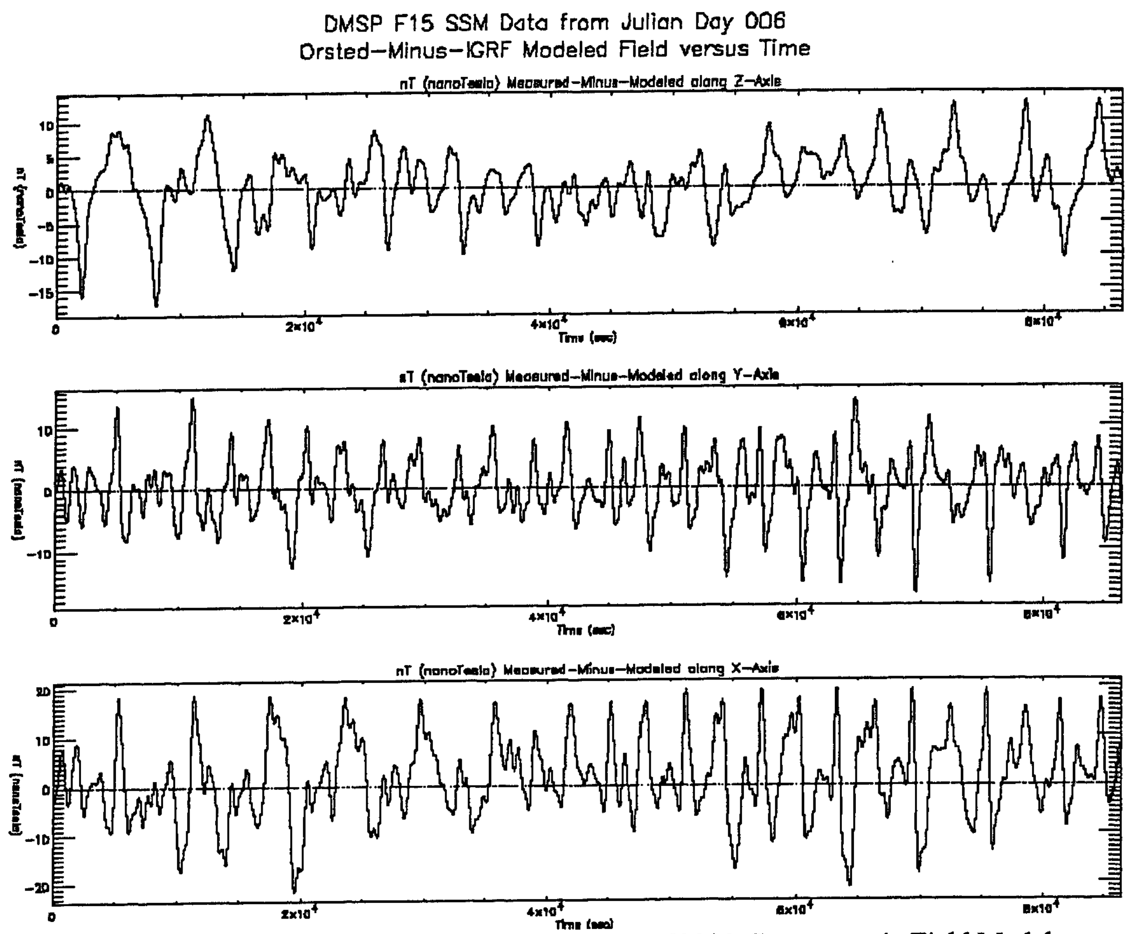


Figure 18. Difference Between Ørsted and IGRF2000 Geomagnetic Field Models.

The first ascending node for the above plot occurs at approximately 3739 seconds UT.

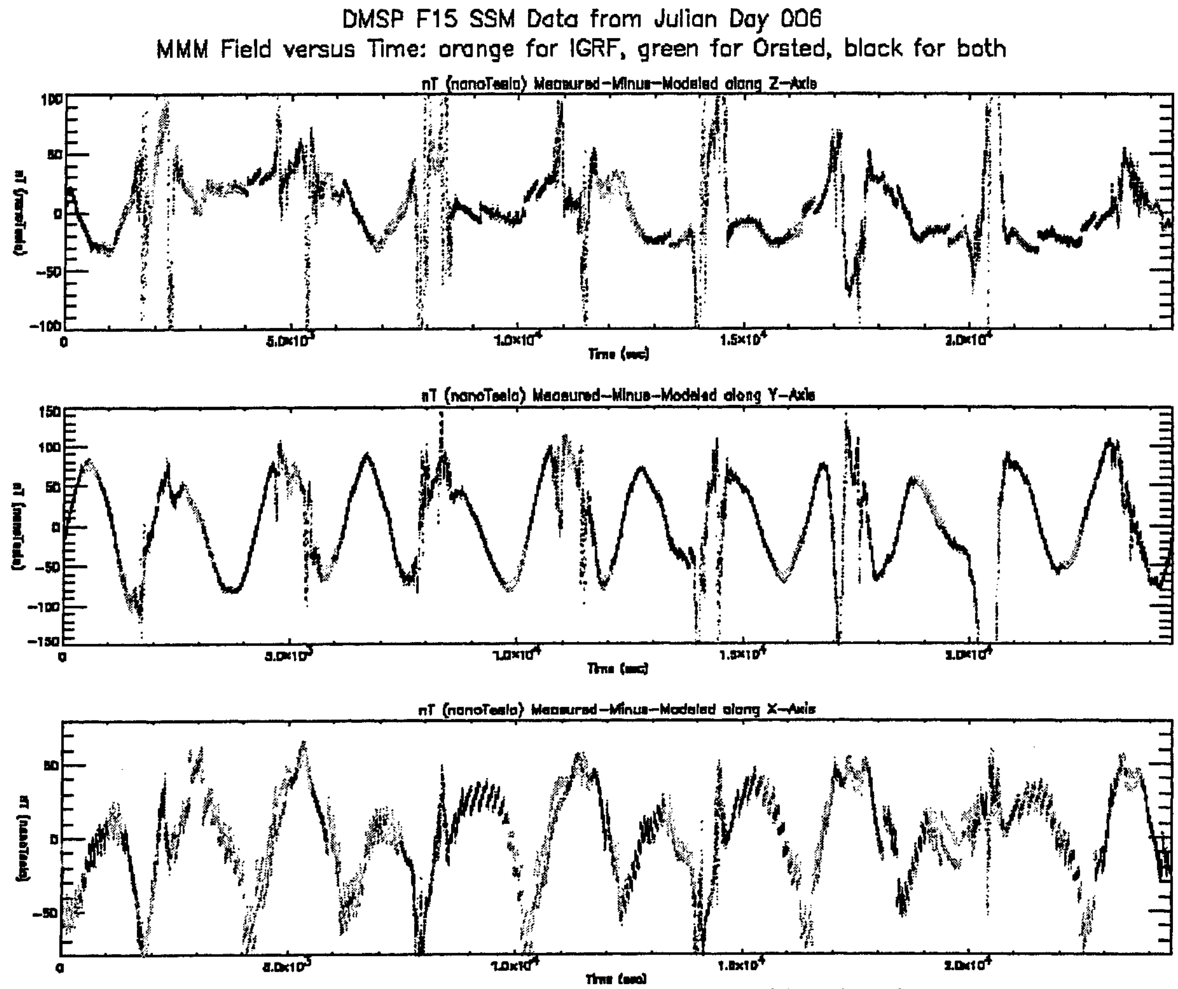


Figure 19. Comparison of Calibrated Measured-Minus-Modeled Fields: Ørsted vs. IGRF 2000.

The first ascending node for the above plot occurs at approximately 3739 seconds UT.

3.6.3 The Effect of dB/dt Coefficients

All of the above comparisons were repeated between the IGRF and "zero" models, where the zero model is derived from the IGRF model by setting all values in the array GT to zero. The zero model is used only to test that the effect of GT from January 1 to January 6 (Day 006) is trivial. Hence, the (zero - IGRF) differences should be tiny, which the matrices and Table 9 in Section 3.6.4 below and the GIF images "mod_zero.gif" and "mmm_zero.gif" indeed verify.

It is noteworthy that except for "mmm_zero.gif", all GIF images contain periodic sinusoidal functions in all three axes.

3.6.4 Calibration-Correction Matrices for Ørsted vs. IGRF 2000 Models

The following matrices show the correction from the final early calibration of Section 2.5, to a calibration based only on data from day 2000-006 using the Ørsted model, with no clipping.

	ORTHO		OFFSET
Ørsted			
0.99933847	-0.00082232	0.00075014	13.54
0.00061829	1.00001383	0.00296111	11.43
-0.00035633	-0.00064480	0.99583765	-23.24

The following matrices show the correction from the final early calibration of Section 2.5, to a calibration based only on data from day 2000-006 using the IGRF 2000 model, with no clipping.

IGRF			
0.99924934	-0.00077048	0.00185994	21.71
0.00054233	0.99993498	0.00231638	7.34
-0.00032003	-0.00064058	0.99683187	-17.37

The following matrices show the correction from the "Ørsted" calibration above, to a calibration based only on data from day 2000-006 using the IGRF 2000 model, with no clipping.

(Ørsted - IGRF)			
0.00008913	-0.00005184	-0.00110980	-8.17
0.00007596	0.00007885	0.00064473	4.09
-0.00003630	-0.00000422	-0.00099422	-5.87

The following matrices show the correction from the final early calibration of Section 2.5, to a calibration based only on data from day 2000-006 using the IGRF 2000 model without dB/dt coefficients, with no clipping.

zero			
0.99926032	-0.00077154	0.00191388	22.27
0.00054307	0.99993883	0.00232613	7.37
-0.00031608	-0.00064096	0.99682911	-17.58

The following matrices show the correction from the above "zero" calibration, to a calibration based only on data from day 2000-006 using the IGRF 2000 model with dB/dt coefficients, with no clipping.

(zero - IGRF)

0.00001098	-0.00000106	0.00005394	0.56
0.00000074	0.00000385	0.00000975	0.03
0.00000395	-0.00000038	-0.00000276	-0.21

TABLE 9. Affect of Different Calibrations Derived From Ørsted vs. IGRF 2000 Models

AAVMMM (nT)	Coefficient Set or Difference				
	Ørsted	IGRF	(Ørsted - IGRF)	zero	(zero - IGRF)
X	21.60	23.44	-1.88	23.49	0.05
Y	45.88	46.10	-0.22	46.10	0
Z	23.80	23.12	0.68	23.15	0.03
Magnitude	63.68	64.72	-1.04	64.76	0.04

4. THE SEARCH FOR BOOM-RELATED ARTIFACTS

This report is a follow-up to previous experiments with the Special-Sensor Magnetometer (SSM) boom on the F15 satellite as written in *Cook, et al.* [1997]. For background information see [*Cook, et al.*, 1997].

After the F15 satellite was launched, real data sets became available. The purpose of this Section is to analyze the effects of adding the F15 boom on real data. This analysis aims to find out whether or not the results of *Cook, et al.* [1997] hold for the real data sets, and to reveal what factors exert the greatest influence on the output measured-minus-modeled amounts of magnetic-field intensity. These factors are listed below in Section 4.8.1.

An additional study attempts to express the effect of adding the boom as the sum of three factors that could twist the boom. These three factors are continual oscillation, sun-induced thermal twist, and impulse twist. Section 4.9 details this study.

Once the contributions of the three factors are hypothesized, they can be subtracted out of the estimated **baseline** curve to get the true baseline curve, which is the difference between the measured and modeled fields when no error is present due to a twist of the F15 boom. Then factors other than the actual field, including artifacts, can be subtracted from the measured field. In this way, one can calculate a more accurate field for all purposes.

4.1 Purpose Of The Boom

This Section addresses why the F15 sensor was placed on a boom, the potential problems with this placement, and how to address these problems.

Ionospheric magnetic field measurements are used to support Department of Defense meteorological forecasting and geophysical research projects. The SSM sensor mounted aboard the DMSP vehicles measures magnetic field vectors at the satellite. This measurement is theoretically composed solely of the ionospheric and geomagnetic fields; in reality, the electrical equipment aboard the satellite provides an additional source of magnetic fields when operating. To avoid this interference, the SSM sensor sits upon a 5m (16.25ft) boom beginning with DMSP F15. As the strength of the interfering magnetic fields varies inversely with the cube of the distance from the sensor, it is hoped that the use of this boom will result in substantial reduction of the interference. Hence, the purpose of the boom-mounted SSM is to significantly decrease the magnetic field changes and jumps generated by the satellite equipment, particularly the artificial jumps found in the F14 plots.

Launched Sunday 12/12/1999 at 12:38 EST, DMSP F15 carries a boom-mounted SSM sensor.

In most F15 data, there are no visually observed errors in the data that compare in magnitude to those induced by the spacecraft's field upon the measurements of the body-mounted instrument. See Section 3 for a discussion of the intermittent and small errors observed in the data.

4.2 Potential Problem With The Boom

However, the boom has its potential disadvantages.

The basic calibration method of Section 2 above can be applied to the body-mounted SSMs of DMSP F12 through DMSP F14, since they are orientated along the sensor axes parallel (+/- 0.5deg) to the spacecraft axes of Down, Motion, and Orbit Normal. The sensor is relatively rigid with respect to the spacecraft body, and thus, the position information of the satellite closely matches the SSM ephemeris.

However, the boom on the DMSP F15 satellite is potentially subject to oscillation through various forces, such as the heat of the Sun. By placing the F15 sensor on this possibly less rigid boom, its orientation might not be predicted as simply as before. An initial look at the data after in-flight calibration reveals that any boom-movement effects are small compared to those errors normally removed by the in-flight calibration.

4.3 Simulating Boom Oscillation

The studies in Sections 4.6, 4.7, and 4.8 of this report simulate possible errors induced by this new sensor placement. Hopefully, by simulating the likely errors, their size and shape can be found out, thereby helping to differentiate them from natural activity. This report studies three potential errors: continual oscillation, thermal, and impulse. However, there may be other errors not effectively simulated by these errors.

These three errors are simple to simulate. They also encompass a wide range of error types, since each error is applied under conditions different from the other two errors. In particular, the continual oscillation is the same for the entire orbit. However, the angle of thermal twist fluctuates as the satellite moves through its orbit, and the impulse twist occurs only when the satellite crosses the equator or the day-night terminator.

4.3.1 Simulation and Effects of a Continual Orientation Error

If the orientation of the placement of the body-mounted SSM has only an accuracy of +/-0.5deg, as stated in Section 4.2 above and in *Cook, et al.* [1997], then one can assume that the orientation of the boom-mounted sensor will vary considerably more from the spacecraft axes. This continual error can be simulated by rotating the measured vectors from various days of SSM data by small angles (1.0deg) about the three sensor axes. This error can be corrected in the same manner as the body-mounted orientation error.

4.3.2 Simulation and Effects of a Varying Orientation Error

While the boom is not likely to be twisting in the wind or bent down by its weight, it will alternate between day and night zones in the course of an orbit. This process of heating and cooling may be enough to torque the boom, changing the orientation of the sensor.

To simplify the simulation, the terminators for this sun-synchronous satellite were previously approximated at its maximum and minimum latitudes (southbound by day, northbound by night). However, because of the axial tilt of the Earth, the satellite does not cross between day and night at its southern and northern peaks, as illustrated Figure 20, for (say) December 22. Hence, this approximation of the terminator crossings was imprecise and thus removed.

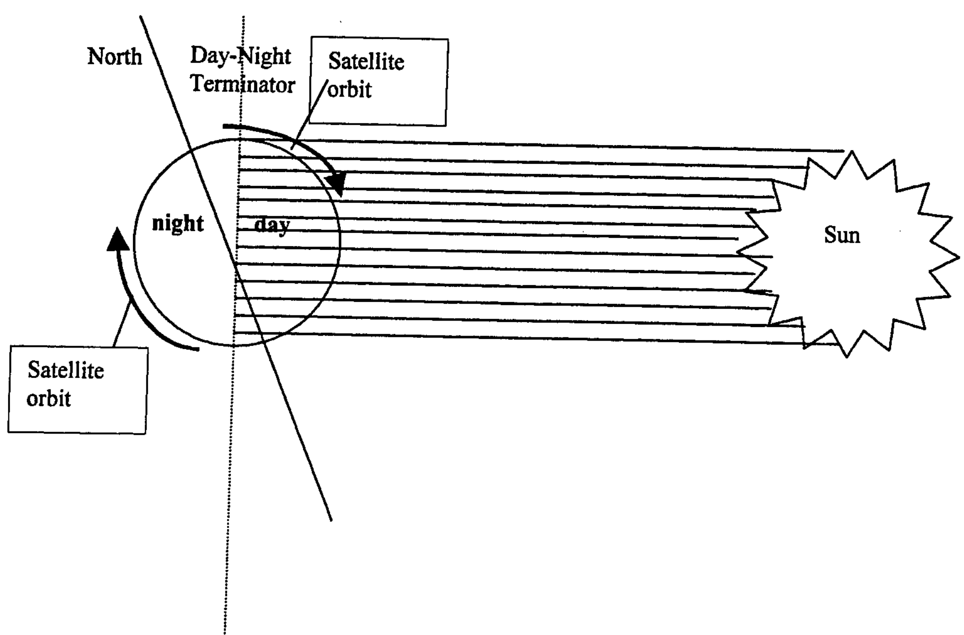


Figure 20. Effect of Earth's Axial Tilt on Day/Night Terminator at Altitude.

The thermal and impulse twists, the latter introduced in Section 4.3.3 below, at the day-night crossings instead of at the peak latitudes.

In addition, the sensor is assumed to rotate about all three axes because of the effect of the solar heating. As the satellite passes into "day," the sensor begins to twist, reaching a maximum twist as it crosses the day-night terminator, and then untwisting on the night side, reaching the original untwisted position as it crosses into day again. The maximum twist angle in all three dimensions is set to 2.5 degrees. No residual vibratory effects are modeled.

4.3.3 Simulation and Effects of a Damped Impulse Error

An impulse effect that might possibly occur to disturb the boom is the operation of the torquing motor. Such an impulse disturbance would be quickly damped out by the mechanical damping system in the boom assembly. This error is modeled by applying an instantaneous twist of 2.5deg about all three of the sensor axes, and then reducing that twist as a function of time so that the twist is reduced by 98 percent in 30 seconds. To show its varying impact, this error is applied at each crossing of the day-night terminator and the equator.

4.4 Model Used To Produce The Simulation Data Plots

This Section describes the mathematical model used to simulate the above three error types.

4.4.1 The Model Equation

The calibration for F14 exhibited a constant angular error and offset, as characterized in the ORTHO and OFFSET calibration matrices in the equation below that is copied from Section 3.1.

$[B_{true}] = [ORTHO]*[B] + [OFFSET]$; that is,

$$\begin{bmatrix} B_{x\_true} \\ B_{y\_true} \\ B_{z\_true} \end{bmatrix} = \begin{bmatrix} ORTHO_{11} & ORTHO_{12} & ORTHO_{13} \\ ORTHO_{21} & ORTHO_{22} & ORTHO_{23} \\ ORTHO_{31} & ORTHO_{32} & ORTHO_{33} \end{bmatrix} \begin{bmatrix} B_x \\ B_y \\ B_z \end{bmatrix} + \begin{bmatrix} OFFSET_x \\ OFFSET_y \\ OFFSET_z \end{bmatrix}, \text{where :} \tag{8}$$

$[B_{true}]$ = the calibrated magnetic field,
[B] = the measured magnetic field before calibration, and
[ORTHO] and [OFFSET] are the calibration matrices

However, for F15, any additional contribution to the offset error should be minimal at the end of the boom. This contribution is easy to remove despite interference from other factors.

Therefore, our model ignores the offset and addresses only angular error. In other words, it sets OFFSET in the above equation to the 3x1 zero vector to form the equation below:

$[B_{true}] = [ORTHO] * [B]$ that is,

$$\begin{bmatrix} B_{x\_true} \\ B_{y\_true} \\ B_{z\_true} \end{bmatrix} = \begin{bmatrix} ORTHO_{11} & ORTHO_{12} & ORTHO_{13} \\ ORTHO_{21} & ORTHO_{22} & ORTHO_{23} \\ ORTHO_{31} & ORTHO_{32} & ORTHO_{33} \end{bmatrix} \begin{bmatrix} B_x \\ B_y \\ B_z \end{bmatrix}. \quad \textbf{(9)}$$

The angular error due to the boom is divided into three types. Each error type is a twist in the boom. This twist is applied by multiplying each 3x1 measured magnetic field vector BMEAS, one for each time interval, by a 3x3 matrix ROTAT to obtain BTEMP. ROTAT rotates BMEAS in three dimensions, using three angles A, B, and C, as in the equation below. Here we changed the notation of the matrix and vectors from [B_{true}], [ORTHO], and [B] to [BTEMP], [ROTAT], and [BMEAS], respectively. The former quantities pertain to the calibration; the latter simulate boom rotation.

$$\begin{bmatrix} BTEMP_X \\ BTEMP_Y \\ BTEMP_Z \end{bmatrix} = [ROTAT] * \begin{bmatrix} BMEAS_X \\ BMEAS_Y \\ BMEAS_Z \end{bmatrix}. \quad \textbf{(10)}$$

[ROTAT] is the product of the three rotation matrices $R_A R_B R_C$, where

$$R_A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & cA & sA \\ 0 & -sA & cA \end{bmatrix}, \quad R_B = \begin{bmatrix} cB & 0 & -sB \\ 0 & 1 & 0 \\ sB & 0 & cB \end{bmatrix}, \quad R_C = \begin{bmatrix} cC & sC & 0 \\ -sC & cC & 0 \\ 0 & 0 & 1 \end{bmatrix}. \quad \textbf{(11)}$$

Here, cA, cB, and cC are shorthand for cos(Aπ/180), cos(Bπ/180), and cos(Cπ/180), respectively. sA, sB, and sC are shorthand for sin(Aπ/180), sin(Bπ/180), and sin(Cπ/180), respectively. The π/180 adjustment is due the fact that A, B, and C measure degrees, not radians.

Each BMEAS vector is read out of one temporary file. Each new record, including the BTEMP vectors, is copied to a second temporary file. After all computations are performed, the second temporary file is copied back into the first one for the next subroutine.

4.4.2 Algorithms that Simulate the Twist Types

To implement the three errors, a version of APSM was modified to include the following additional subroutines for testing purposes: APSM_OSCILLATION for continual oscillation, APSM_THERMAL for heat-induced oscillation, and APSM_IMPULSE for rotation due to damped impulses. Each of these subroutines can be either turned on or disabled by commenting

out its call in the main routine of APSM. Each subroutine contains one or more parameters that can be easily adjusted.

4.4.2.1 Continual Twist
The simplest error is continual oscillation, controlled by Subroutine APSM_OSCILLATION. Misalignment causes this oscillation, in which the boom is rotated by a three-dimensional rotation matrix by three angles, A, B, and C, in the YZ, XZ, and XY planes, respectively. As the oscillation is continual, the boom is assumed to remain in its rotated position throughout the day of each prepfile run through APSM. Hence, this matrix is applied to every 3x1 field vector. Subroutine APSM_OSCILLATION controls A, B, and C.

4.4.2.2 Thermal Twist
Run by Subroutine APSM_THERMAL, thermal oscillation potentially arises from sun-induced heating and cooling of the boom and its resulting flexing. This rotation matrix varies over time, with the three rotation angles equal at all times. These angles are equal to the maximum (PMAX) as the satellite crosses from day to night, and to zero while crossing from night to day. In between crossings, the angles vary linearly between zero and PMAX. The parameter PMAX can be set to different values, typically 2.5 or 5 degrees.

4.4.2.3 Impulse Twist
The final type of twist is a single impulse, controlled by Subroutine APSM_IMPULSE, that begins each time the satellite crosses the day-night terminator or the equator. The impulse starts at the maximum angle PMAX, which in our experiment is typically 2.5 or 5 degrees. Over the next minute, it is exponentially damped according to the following equation:

IMPULSE = PMAX * exp(-ALPHA*s),

where ALPHA = ln(50)/30, the factor that reduces the impulse by 1/50 after 30 seconds, and "s" is the number of seconds that elapsed since the start of the impulse. All three rotation angles are equal to IMPULSE, which is zero for most 3x1 field vectors.

4.4.3 Jump Removal

All jump removal routines were in use during the entire experiment to eliminate jumps and noise as factors, other than the three twist types, that are contained in the "boom minus non-boom" field difference.

4.5 Rules Of The Analysis Of Boom Effects

The following rules are observed throughout this experiment:

The direction of increasing numbers on the X-axis is assumed to be downward. Similarly, the Y-axis points in the direction of motion of the satellite. The Z-axis points in the orbit-normal direction.

To save memory space, all output plot files are produced in GIF format rather than in PostScript.

4.5.1 Sample Data Used

In Section 4.9, another set of data days from the Boston College prepfiles for F15 was processed through APSM, this time using the TLE ephemeris instead of the ephemeris interwoven in the Boston-College prepfiles. The TLE ephemeris is more accurate, and it could be expected to limit its error to a consistent amount.

The following six sample days were chosen, since they are equidistant and span most of the days represented in the TLEs of the file DMSP_TLE_FILE.TXT. This span was enough to determine whether or not calibration drift, which causes the continual twist to move over several months, was present. For improved precision, all six days were late enough so that no near-launch orbital perturbations or adjustments would occur. However, this range of less than 6 months of data is possibly insufficient of allow for the observation of potential seasonal variation.

Day 2000-050 (02/19/2000)
Day 2000-083 (03/23)
Day 2000-116 (04/25)
Day 2000-149 (05/28)
Day 2000-182 (06/30)
Day 2000-215 (08/02)

4.5.2 Why Body-Mounted and Boom-Mounted SSM Data Can Not be Compared

The F15 sensor sits on a boom, whereas the F14 sensor does not. Thus, it is tempting to treat the F15 data as the field measured on the boom, and the F14 non-boom measurements as a model of the field without the boom. Hence, it seems that one can use (F15 - F14) as the difference due to the boom.

Unfortunately, at a given time, these two satellites are generally in different positions. Hence, their modeled fields $F15_{mod}$ and $F14_{mod}$ at these positions are different, so that subtracting them will not provide a meaningful comparison. Similarly, their measured fields $F15_{meas}$ and $F14_{meas}$ can not be compared. Neither can their measured-minus-modeled differences ($F15_{meas}$ - $F15_{mod}$) and ($F14_{meas}$ - $F14_{mod}$) be compared, since the direction of the vector (x, y, z) of measured-minus-modeled difference depends on the latitude and longitude of the satellite. By the time one

spacecraft is in a comparable position to an earlier position of the second spacecraft, the field will have changed due to day/night and other time-dependent considerations.

Even the field-versus-latitude plots can not use the (F15 - F14) differences, since at a given latitude the two satellites generally occupy different longitudes, rendering it meaningless to compare F15 with F14.

Furthermore, the major difference between the boom and body-mounted measurements is a positive one; the accuracy of the body-mounted measurements is considerably impaired by the spacecrafts' fields, and with the potential boom-dependent errors visually observed to be less than the effect of the spacecrafts' fields, the body-mounted sensors have insufficient precision for the desired comparisons.

Hence, this experiment does not utilize data from body-mounted SSMs.

4.5.3 Definition of the Boom Effect

The effect of adding the boom is defined by subtracting the magnetic field based on a model of the magnetic field of the Earth, from the field (strength) that F15 measures. In other words, the boom effect is set equal to ($F15_{meas}$ - $F15_{mod}$), where $F15_{meas}$ = the measured field and $F15_{mod}$ = the modeled field. This definition is valid since $F15_{meas}$ is the field measured from the boom, whereas $F15_{mod}$ is theoretically the measurement of a sensor not on the boom, thereby making ($F15_{meas}$ - $F15_{mod}$) the required "boom minus non-boom" measurement. The curve that plots ($F15_{meas}$ - $F15_{mod}$) without additional twist effects is called the **baseline curve**.

However, in general, the above definition does not apply in practice. The baseline ($F15_{meas}$ - $F15_{mod}$) also includes all real boom-induced errors and other activity, besides the twist types that are added to simulate them. This activity consists of the following and other factors: error in the model field, natural ionospheric activity, real manmade sources of magnetic fields such as satellite equipment (jumps), measurement error, and error in correlation between measurement and model. This correlation error includes magnetometer position and alignment errors due to ephemeris errors, in-flight calibration errors, and movement of the boom.

Therefore, if we minimize or neglect the errors we have control over (ephemeris error, calibration, jumps, model field), then measured-minus-modeled equals ionospheric activity. If activity is low or quiet, then ionospheric activity is low or non-existent, and measured is equal to modeled, so that we can consistently and accurately decompose ($F15_{meas}$ - $F15_{mod}$) into the effects modeled above in Section 4.4. Therefore, it would be preferable to pick days of minimal activity.

The point of the boom study is that the boom got rid of the manmade sources of magnetic fields, but may have added errors in SSM axis versus satellite axis due to boom motion. Thus, we figure out what a boom-induced error will look like (Sections 4.6, 4.7, and 4.8), look for it (Section 4.9), so that it can be removed in the next project.

The table at the FTP link in [*NOAA*, 2001] reveals the following Kp indices for the days listed above in Section 4.5.2. Days 2000-050, 2000-116, and 2000-182 have low Kp values ranging between 0 and 2. The Kp values of 2000-149 and 2000-215 are moderate, with range between 1 and 3. 2000-083 has Kp values between 2 and 4.

4.5.4 The Output MFR File

"MFR" stands for Magnetic Field Records. The MFR file contains the measured-minus-modeled intensities, in NanoTesla (nT) of the magnetic field in each axis (X, Y, and Z) for each second of data that APSM successfully processed. This file also holds the minutely ephemeris, which includes information about the satellite location.

4.5.5 Calibration Independence

The studies of Sections 4.6, 4.7, and 4.8 are independent of the calibration matrices ORTHO and OFFSET used to generate the MFR files and other output. In other words, the results of these studies are the same regardless of the values of ORTHO and OFFSET. This premise is true since the results compare plotted curves with various simulated boom twists to the same curves without them, as well as comparing different simulated twists to one another. In each of these comparisons, ORTHO and OFFSET are kept at fixed amounts.

In contrast, the boom-effect decomposition study of Section 4.9 is NOT independent of ORTHO and OFFSET. The results of each data day, tabulated in Sections 4.9.1.2 through 4.9.1.6, are the solution coefficients to a least-squares equation. This equation involves output data that depend on ORTHO and OFFSET. Likewise, the other results of Section 4.9 are based on calibration-dependent data.

However, the overall results summarized in Section 4.9.3 are expected to be the same no matter what particular calibration matrices are used.

4.6 Confirming the Results of the Boom Simulation Study

The first task of the F15 experiment was to confirm which results previously obtained in *Cook, et al.* [1997] hold for each data set, and to change them if necessary.

4.6.1 Method Used to Produce the Data Plots

As in *Cook, et al.* [1997], seven variations of APSM were used, one for each F15-boom twist type tabulated below. Each variation was obtained by switching on and off calls from APSM.F to subroutines APSM_OSCILLATION, APSM_THERMAL, and APSM_IMPULSE, and by changing parameters in APSM_OSCILLATION and APSM_IMPULSE themselves.

After all MFR files were produced, the actual data was separated from the ephemeris in each MFR file and copied to a test file, whose name represented the day when this data was collected. An IDL program then converted these test files into GIF-image plots of magnetic field intensity (NanoTesla) versus Universal Time in seconds. APSM was then revised and recompiled for the next variation.

In APPENDIX H, the plots in Figures 48 through 54 cover all cases for the first four hours (midnight to 04:00 UT) of Julian Day 1999-357 (12/23/1999). Figures 48 through 54 are treated in Section 4.6. Section 4.7 discusses the plots in Figures 55 through 58. The last plots, in Figures 59 through 63, belong to Section 4.9 and do not cover Day 1999-357.

Each line of Table 10 below represents a variation of APSM run in this study. The left-hand entry of each line is a template for the name of the plot files produced, the central entry is the figure number in APPENDIX H, and the right-hand entry describes the experimental conditions graphed in the plot files. In each file name, "yyddd" = last two digits of year, followed by the day-of-year. "s" = Section of the day (1-6) where each Section covers four hours.

TABLE 10. Table of Plots

Name	Figure No.	Conditions
BASELINE_yyddd_s.GIF	48	No twist
OSC101_yyddd_s.GIF	49	Continual twist in 2 dimensions: twist = (1,0,1) degrees in (A,B,C)
OSC11MINUS1_yyddd_s.GIF	50	Continual twist in 3 dimensions: twist = (1,1,-1) degrees in (A,B,C)
THERM_yyddd_s.GIF	51	Sun-induced twist, maximum twist = 2.5 degrees
IMPUL1P5_yyddd_s.GIF	52	Damped impulse twist, maximum twist = 1.5 degrees
IMPUL2P5_yyddd_s.GIF	53	Damped impulse twist, maximum twist = 2.5 degrees
ALL_yyddd_s.GIF	54	Combined twists of OSC11MINUS1, THERM, and IMPUL2P5

4.6.2 Results

The resulting GIF plots were visually inspected. The curves of each variation of APSM were compared and observations made, as outlined below in Sections 4.6.2.1 through 4.6.2.3.

4.6.2.1 Effects of Different Twist Types

The baseline case is shown below in Figure 21, and again in Figure 48 in APPENDIX H.

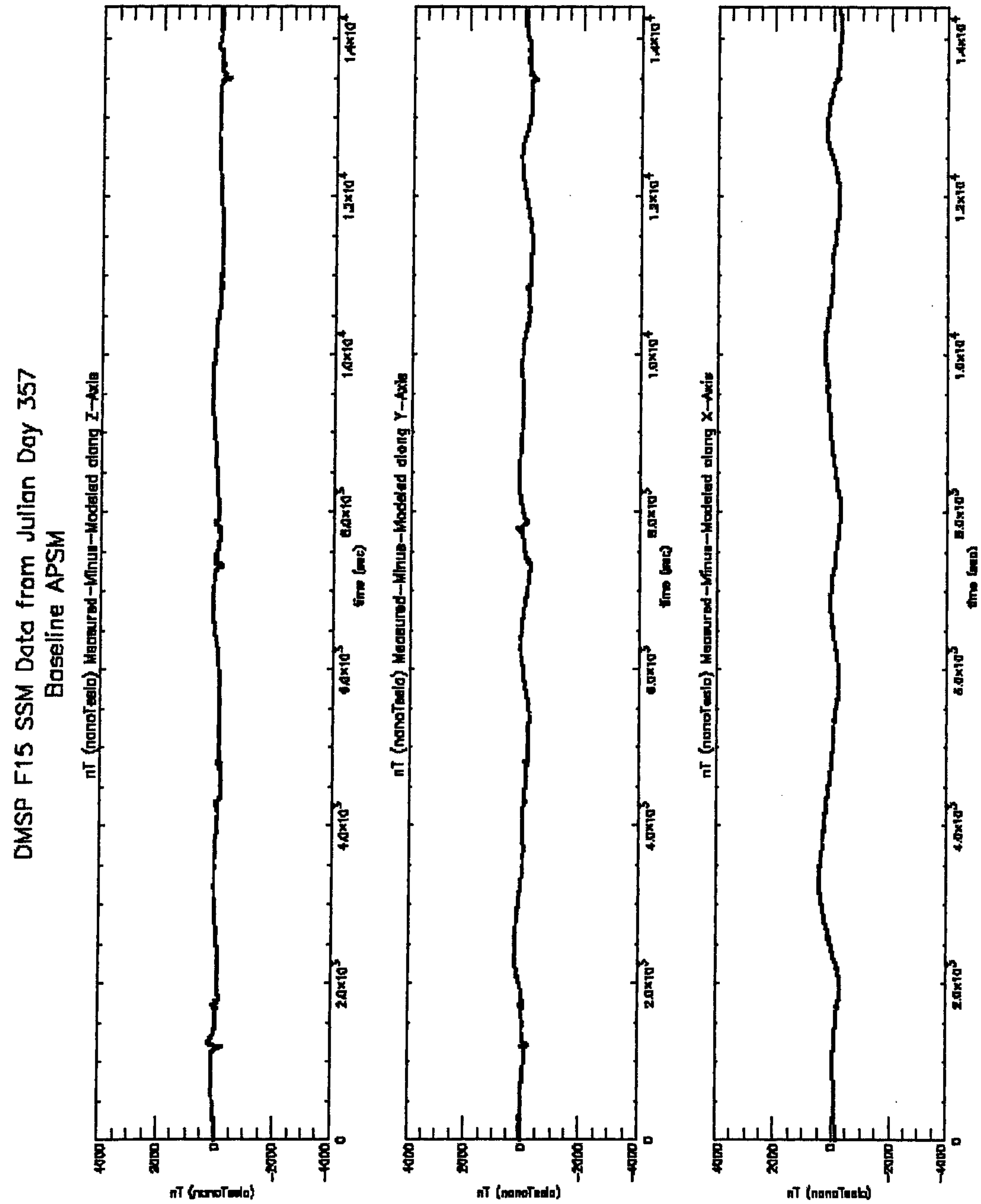


Figure 21. Baseline Curve, Day 357-1999, 00:00-04:00 UT (and Figure 48 in APPENDIX H).

Its data lacks angular-twist changes in the magnetic field. The baseline curves have oscillations in all three axes that are similar to, but most often weaker than, those of the continual-twist cases. The jump-removal subroutines APSM_REMOVE_LARGE_JUMPS, APSM_REMOVE_SMALL_JUMPS, and the artifact-noise removal subroutine APSM_REMOVE_NOISE leave these curves mostly smooth. However, most of the baseline curves Y and Z have bumps that resemble knots at the north and south latitude peaks of each orbit. Figure 22 displays the occurrence of these bumps in one orbit.

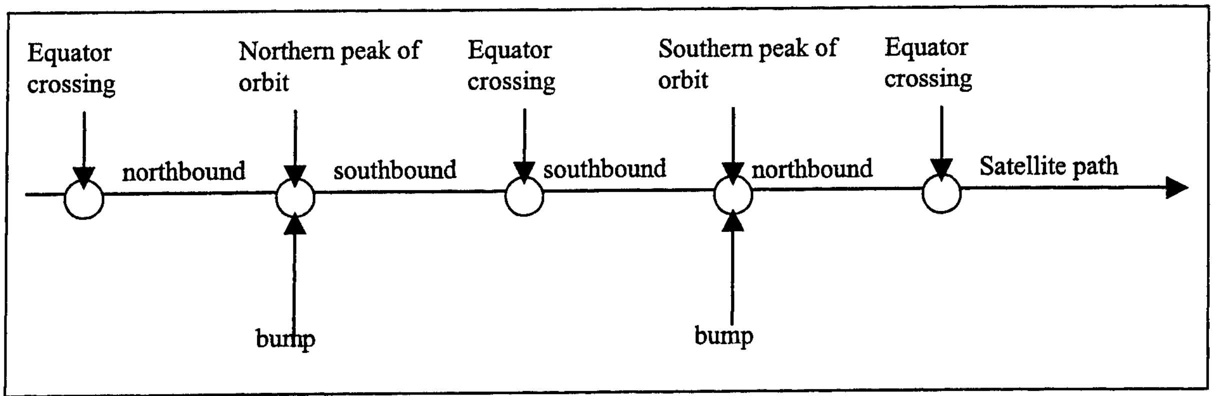


Figure 22. Occurrence of Phenomena in Baseline Curves.

Figure 23 shows that simulating the continual-twist case yields an orbital-periodic artifact consisting of waves with amplitude of roughly 700 nT on each axis. Many waves have two humps, one higher than the other. Sometimes, the smaller hump is barely visible. For other waves it is nonexistent, so there is only one hump. The waves on all three axes are approximately centered over the zero-nT line. The peaks and troughs of the X-axis curve occur whenever the satellite crosses the equator, whereas the peaks and troughs of curves Y and Z take place when the satellite crosses the day-night terminator. Figure 24 displays the occurrence of peaks and troughs in one orbit.

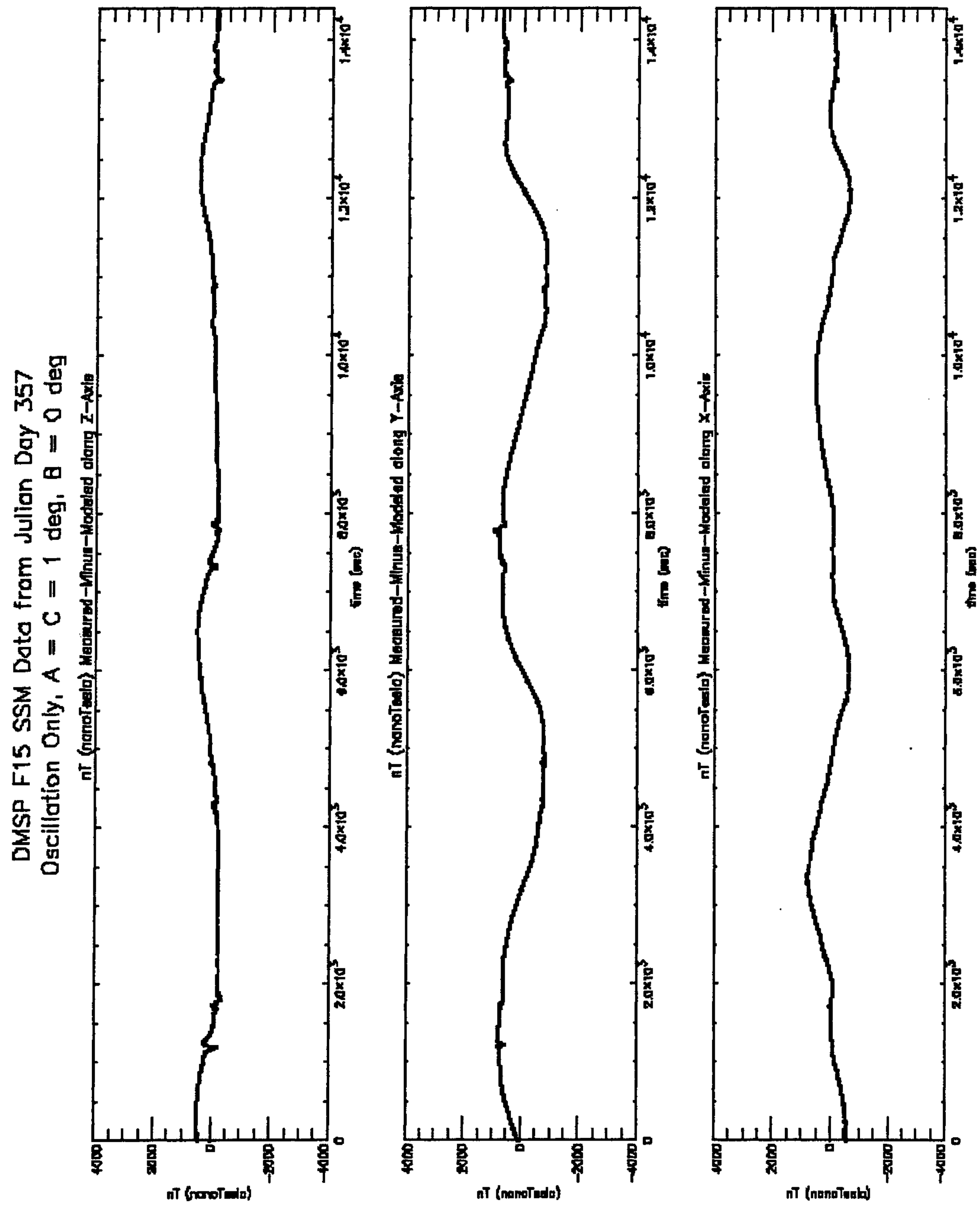


Figure 23. Continual Twist, (A,B,C) = (1,0,1), Day 357-1999, 00:00-04:00 UT (Figure 49 in APPENDIX H).

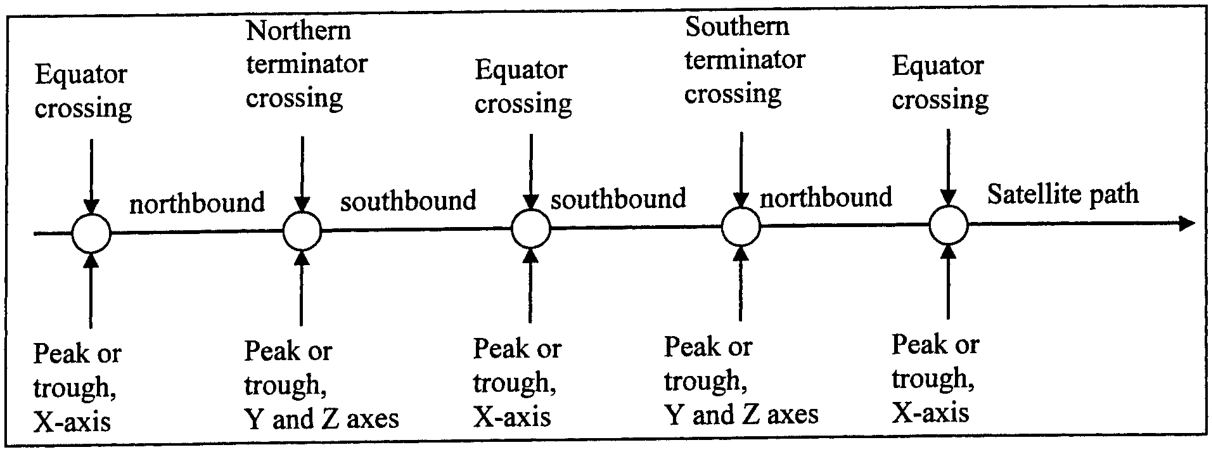


Figure 24. Occurrence of Peaks and Troughs in One Orbit for the Continual Twist Case.

Figure 25 depicts the simulation of the sun-dependent twist, which also results in an orbitally-periodic artifact in all three axes. This artifact is not in phase with the continual-twist artifact. Larger in amplitude than the continual-twist waves, the thermal-twist waves have peaks that correspond to crossings of the day-night terminator that occur near extremes of the satellite latitude.

The Z-axis curve has a double peak on each peak-trough-peak cycle. This double peak occurs at two spots with amplitude typically about 500 nT. These peaks straddle a valley in the curve where the satellite passes from night to day. This valley occupies the zero-nT level and spans roughly 1800 seconds, or a half-hour. The double peak is less intense than the trough 1500 to 2000 nT deep, where the satellite crosses from day to night. This pattern is inverted for the Y-axis. The waves on the Z-axis are centered under the zero-nT line, whereas the Y-curve is centered over this line, unlike the continual twist in which both curves are centered on this line. The X-curve is centered on this line, lacks double peaks, and its peaks and troughs occur at equator crossings. Figure 26 displays the occurrence of peaks and troughs in one orbit.

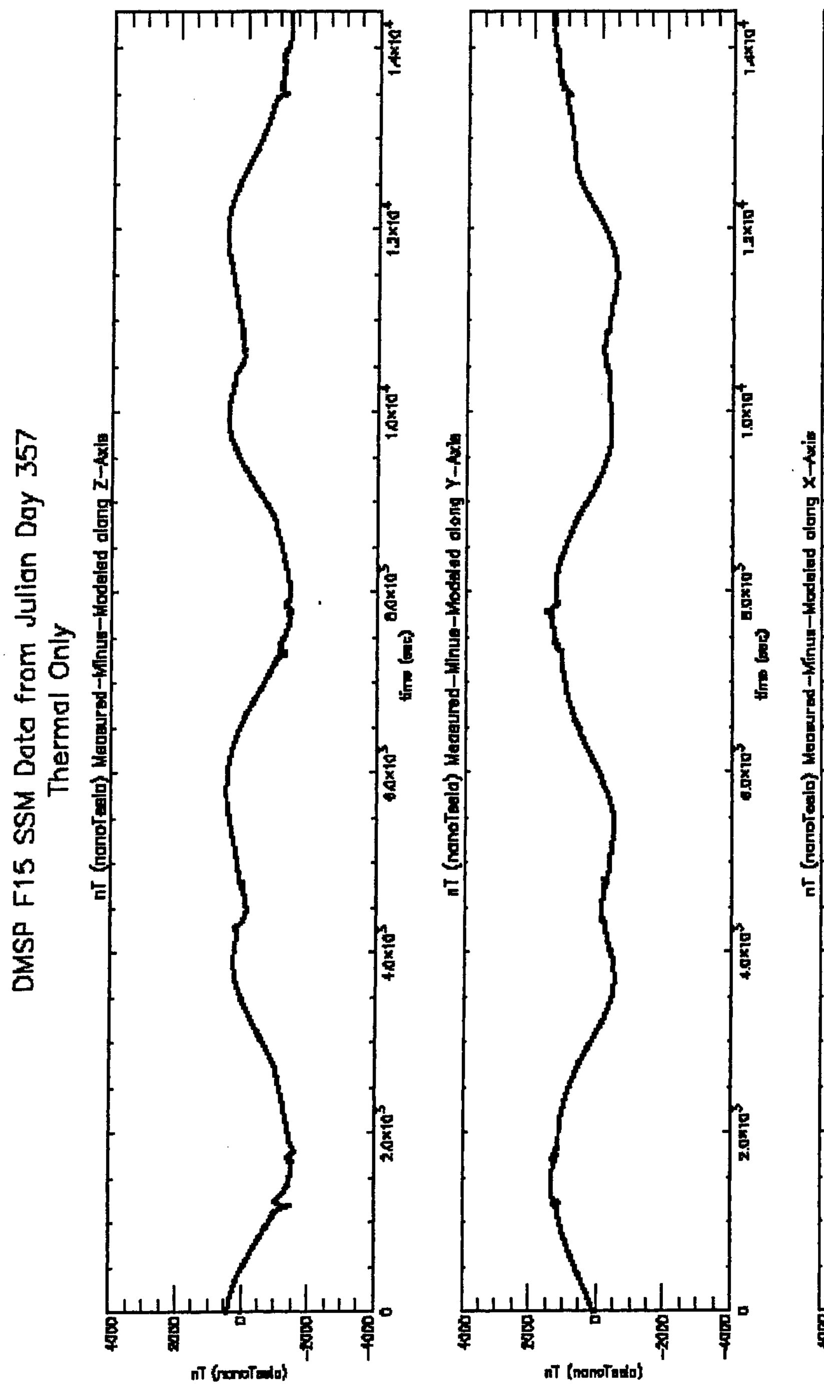


Figure 25. Thermal Twist, Maximum Angle = 2.5 degrees, Day 357-1999, 00:00-04:00 UT (Figure 51 in APPENDIX H).

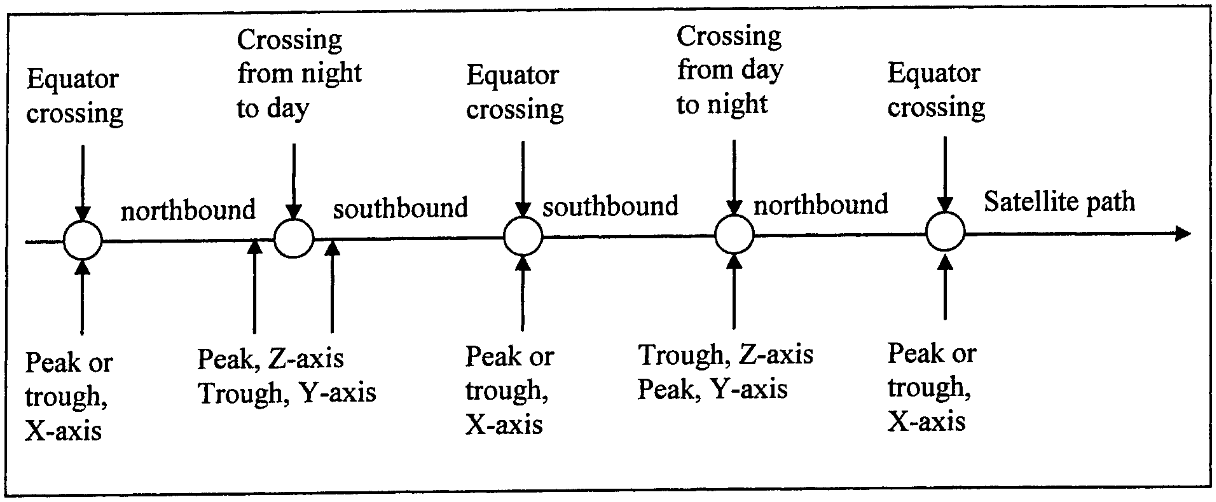


Figure 26. Occurrence of Peaks and Troughs in One Orbit For the Thermal Twist Case.

As depicted in Figure 27 and in Figure 53, simulating the damped impulse results in the baseline curve plus spikes that appear straight since each spike lasts a short time (for one minute) compared with the whole plot (four hours per page).

Each impulse in Subroutine APSM_IMPULSE is a quick rotation in all three planes (XY, XZ, and YZ in this order) by the same angle. Four such impulses per orbit are applied to the satellite boom: one at each equatorial crossing, and one at each crossing of the day-night terminator. While many crossings induce spikes in all three curves, for the equatorial crossings the spikes on the X-curve are higher than the spikes in the dimensions Y and Z, whereas the day-night crossings produce the largest spikes on curves Y and Z; see Figure 28.

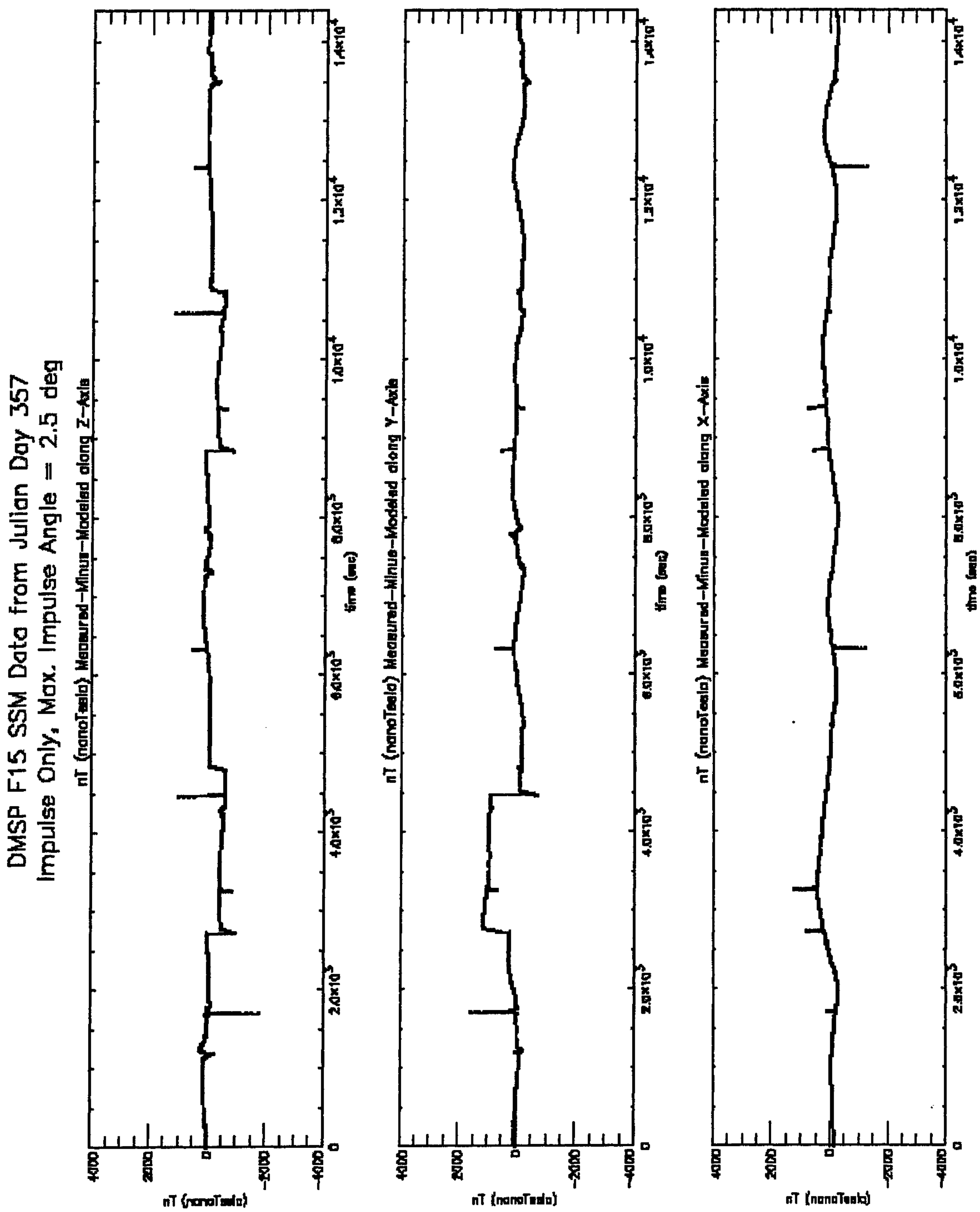


Figure 27. Impulse Twist, Maximum Angle = 2.5 degrees, Day 357-1999, 00:00-04:00 UT (Figure 53 in APPENDIX H).

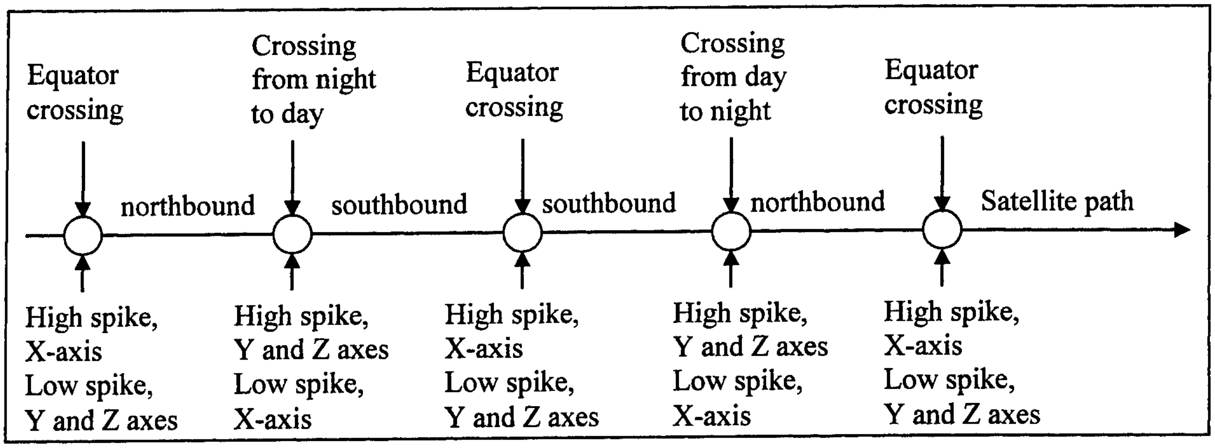


Figure 28. Occurrence of Spikes Due for One Orbit in the Impulse Case.

If these spikes exist in real data, there is the issue of removing such spikes without removing real geophysical phenomena. The trailing edge curve of the spike presents special challenges, as it may be difficult to differentiate features of the auroral regions from activity, or to measure its amplitude as a function of time with real data.

The amplitude of curve X that includes all twist types (Figure 29 and Figure 54) is the sum of the amplitudes of curve X for OSC11MINUS1, THERM, and IMPUL2P5. The same holds true for curves Y and Z.

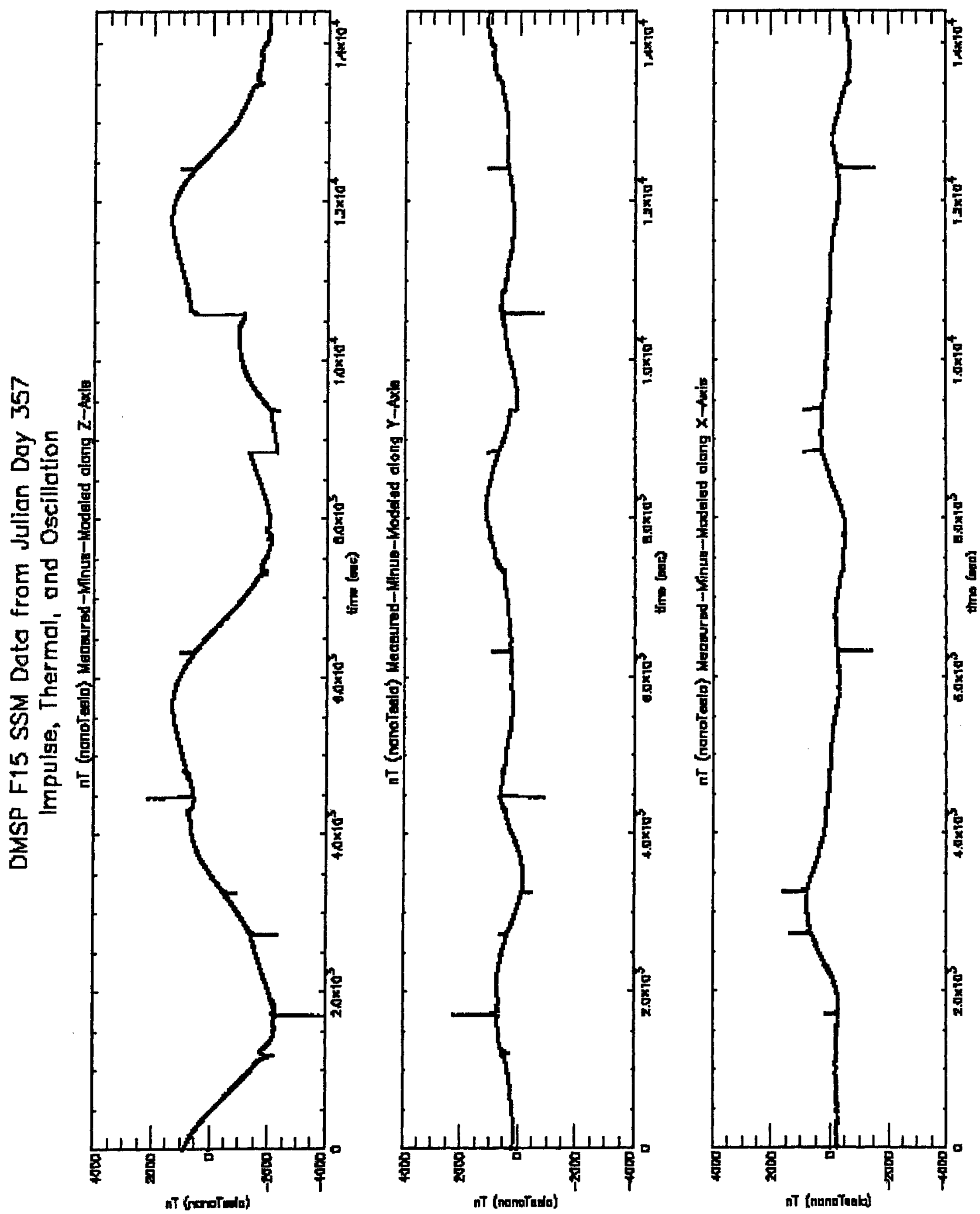


Figure 29. Combination of Continual, Thermal, and Impulse Twists, Day 357-1999, 00:00-04:00 UT (Figure 54 in Appendix APPENDIX H).

4.6.2.2 Two Dimensions versus Three (Continual Twist)

A comparison of Figures 49 and 50 shows that whereas the amplitudes of curves X and Y are independent of the number of dimensions, the Z-axis exhibits a higher-amplitude wave in three dimensions than in two. In fact, the Z-curve has at least the same amplitude, and about the same times of peaks and troughs, as does the Y-curve.

4.6.2.3 1.5 Degrees versus 2.5 Degrees (Impulse Twist)

Figures 52 and 53 demonstrate that the basic curve shape is independent of the angle, but the spikes are about 5/3 as long for 2.5 degrees as for 1.5, suggesting that the spike length is proportional to the maximum impulse angle.

4.6.3 Summary of Results of Preliminary Simulation

The results of this study confirm those of *Cook, et al.* [1997], except for oscillations in the baseline plots for many sample days of data, and stronger oscillations in the X-axis on all plots than those observed in *Cook, et al.* [1997].

These or similar oscillations in the baseline plots can also be seen in F14 data, so that they are not necessarily due to the boom.

The results of this study confirm those of *Cook, et al.* [1997], except for oscillations in the baseline plots for many sample days of data, and stronger oscillations in the X-axis on all plots than those observed in *Cook, et al.* [1997].

Many, but not all, effects (e.g. spikes, thermal oscillations) in the Z-axis are mirrored in the Y-axis.

For the continual and thermal twists, the peaks and troughs of curves Y and Z correspond to satellite crossings of the day-night terminator, which lie near its north and south extremes. However, the peaks and troughs of the X-curve occur when the satellite crosses the equator. Similarly, the impulse twist produces spikes in curves Y and Z at terminator crossings and smaller spikes at equatorial crossings. As in the other twists, this pattern is reversed for the X-curve.

According to Section 4.6.2.3, multiplying an impulse by a certain factor multiplies the amplitude of the resulting spikes by the same factor. This result suggests that multiplying any twist effect by a given factor will multiply the amplitude of the plot by the same factor. Also, the case of all twist types shows that combining two or more twist types adds their effects on the plot, following the rules of constructive and destructive interference of waves. This property is evident from the twist-type routines (OSCILLATION, THERMAL, and IMPULSE) of APSM that add each effect, one at a time, to the amount to be plotted. In other words, the relationship between twist effects and curve amplitude appears to be both multiplicative and additive, and

thus linear. This conjecture will be proved below in Sections 4.8.4.1 through 4.8.4.3 for all three twist types analyzed in this report.

4.7 Filling In The Gaps: Effects Of Dimensions Of Continual Twist

Because of time and storage considerations, the studies in Sections 4.7 and 4.8 used only the three days 1999-357, 2000-012, and 2000-019 corresponding to 12/23/1999, 01/12/2000, and 01/19/2000, respectively. These days were selected because they had few data gaps relative to those of the other days. These studies were run similarly to the first study (see Section 4.6.1 above).

It was decided that several more cases were needed as a supplement to the above study. These cases were added to corroborate the results of Section 4.6 and provide new conclusions.

4.7.1 The Compared Plots

These cases produced the following GIF files for each of the above three days. The GIF files for the first four hours of Day 1999-357 appear in APPENDIX H, Figures 55 through 58:

OSC111_yyddd_s.GIF	55	Continual twist = (1,1,1) degrees in (A,B,C)
OSCA01_yyddd_s.GIF	56	Continual twist = (1,0,0) degrees in (A,B,C)
OSCB01_yyddd_s.GIF	57	Continual twist = (0,1,0) degrees in (A,B,C)
OSCC01_yyddd_s.GIF	58	Continual twist = (0,0,1) degrees in (A,B,C)

These additional trial runs, combined with the runs for (1,1,-1) and (1,0,1) in Section 4.6.1 above, brought the total for this study to the six cases listed below:

$$(A,B,C) = (1,1,-1) \quad \textbf{(12)}$$
$$(A,B,C) = (1,1,1) \quad \textbf{(13)}$$
$$(A,B,C) = (1,0,1) \quad \textbf{(14)}$$
$$(A,B,C) = (0,0,1) \quad \textbf{(15)}$$
$$(A,B,C) = (0,1,0) \quad \textbf{(16)}$$
$$(A,B,C) = (1,0,0) \quad \textbf{(17)}$$

Each continual twist was applied nonstop throughout the entire day. These GIF plots were visually compared with each other based on the overall amplitudes of curves X, Y, and Z in the plots.

4.7.2 Results

Table 11 charts the six cases. Each entry of the table contains codes for X, Y, and Z that indicate the result of this comparison. Each of these codes is interpreted as follows:

up	- case directly above this box has the sharper curve (higher overall amplitude)
right	- case directly to the right of this box has the sharper curve
=	- the curve has approximately equal amplitude in both cases

For example, "X up" means that the amplitude of the X-curve in the case above this box is greater than in the case to the right of this box. In particular, for the entry drawn in bold below, curves X and Y for **(1,0,1)** have higher amplitudes, but the Z-curve has a lower amplitude, than for **(0,1,0)**.

The figure numbers in this table correspond to plots in Figures in APPENDIX H that illustrate each case for Day 1999-357.

TABLE 11. Comparison of the Six Cases

(1,1,-1) (Figure 50)					
X = Y = Z =	(1,1,1) (Figure 55)				
X = Y = Z up	X = Y = Z up	**(1,0,1)** **(Figure 49)**			
X = Y = Z up	X = Y = Z up	X = Y = Z up	(0,0,1) (Figure 58)		
X up Y up Z =	X up Y up Z =	**X up** **Y up** **Z right**	X up Y up Z right	**(0,1,0)** **(Figure 57)**	
X up Y up Z up	X up Y up Z up	X up Y up Z =	X up Y up Z right	X = Y = Z up	(1,0,0) (Figure 56)

The results in this table are summarized as follows.

The cases (1,1,-1), (1,1,1), (1,0,1), and (0,0,1), for which the angle C = 1 degree, produce sharper curves in X and Y than do (0,1,0) and (1,0,0), for which C = 0. This result confirms the theoretical assumption that increasing angle C sharpens curves X and Y; this assumption is stated in Section 4.8.3 and proved in Section 4.8.4.1.

The cases (1,1,-1), (1,1,1), and (0,1,0) produce a sharper Z-curve than do (1,0,1) and (1,0,0). The Z-curve for (0,0,1) is the flattest. However, according to Observation 2 in Section 5.8.3,

angles A and B sharpen the Z-curve, so (0,1,0) should have been in the middle category with (1,0,1) and (1,0,0).

There is no essential amplitude difference between (1,1,1) and (1,1,-1), but in X and Y (controlled by C) there is a 180-degree (complete) phase difference because C = 1 for (1,1,1) and C = -1 for (1,1,-1). This statement agrees with the conjecture, stated above in Section 4.6.3 and proved below in Section 4.8.4.1, that multiplying C by -1 multiplies the amplitudes of X and Y by the same factor -1.

4.8 How The Factors Influence The Measured Field

NOTE: Any mention below of "multiplying the amplitude (or another feature) of a curve by N" often means multiplying it by a factor approximately N, but not necessarily equal to N itself.

4.8.1 Selection of Factors

This study analyzed what factors (and parameter value for each factor) produced the greatest effects. However, the possibilities were so complex that there was no time to cover all of them. Thus, we chose the following factors and their parameters:

Day Number (prepfile)
Time of Day
Amount of continual twist in YZ plane (Angle A): 1, 5, 10, and 30 degrees
Amount of continual twist in XZ plane (Angle B): 1, 5, 10, and 30 degrees
Amount of continual twist in XY plane (Angle C): 1, 5, 10, and 30 degrees
Maximum twist angle induced by heat: 5, 10, and 30 degrees
Maximum impulse angle: 5, 10, and 30 degrees
Damping time: 5, 10, 60, 120, and 1200 seconds
Number of seconds to apply impulse: 5, 240, and 2400 seconds

As explained in Section 4.4.2.1 above, each continual twist was applied nonstop the entire day. The continual twist was the only twist type in which the three rotation angles were different from each other. As stated in Section 4.4.2.2, each sun-induced twist was at its maximum when the satellite crossed from day to night, and zero in night-to-day crossings. At all other times, this twist varied linearly. As Section 4.4.2.3 indicates, each damped impulse twist was applied briefly at the equator and terminator crossings.

The factors of day and time were analyzed using previously produced graphs. The remaining factors utilized the following variations of APSM:

OSCA01_yyddd_s.GIF	Continual twist = (1,0,0) degrees in (A,B,C)
OSCA05_yyddd_s.GIF	Continual twist = (5,0,0) degrees in (A,B,C)
OSCA10_yyddd_s.GIF	Continual twist = (10,0,0) degrees in (A,B,C)
OSCA30_yyddd_s.GIF	Continual twist = (30,0,0) degrees in (A,B,C)
OSCB01_yyddd_s.GIF	Continual twist = (0,1,0) degrees in (A,B,C)
OSCB05_yyddd_s.GIF	Continual twist = (0,5,0) degrees in (A,B,C)
OSCB10_yyddd_s.GIF	Continual twist = (0,10,0) degrees in (A,B,C)
OSCB30_yyddd_s.GIF	Continual twist = (0,30,0) degrees in (A,B,C)
OSCC01_yyddd_s.GIF	Continual twist = (0,0,1) degrees in (A,B,C)
OSCC05_yyddd_s.GIF	Continual twist = (0,0,5) degrees in (A,B,C)
OSCC10_yyddd_s.GIF	Continual twist = (0,0,10) degrees in (A,B,C)
OSCC30_yyddd_s.GIF	Continual twist = (0,0,30) degrees in (A,B,C)
THERM05_yyddd_s.GIF	Sun-induced twist, maximum twist = 5 degrees
THERM10_yyddd_s.GIF	Sun-induced twist, maximum twist = 10 degrees
THERM30_yyddd_s.GIF	Sun-induced twist, maximum twist = 30 degrees
IMPMAX05_yyddd_s.GIF	Damped impulse twist, maximum twist = 5 degrees
IMPMAX10_yyddd_s.GIF	Damped impulse twist, maximum twist = 10 degrees
IMPMAX30_yyddd_s.GIF	Damped impulse twist, maximum twist = 30 degrees
IMPDMP005_yyddd_s.GIF	Damped impulse twist, damping time = 5 seconds
IMPDMP010_yyddd_s.GIF	Damped impulse twist, damping time = 10 seconds
IMPDMP060_yyddd_s.GIF	Damped impulse twist, damping time = 60 seconds
IMPDMP120_yyddd_s.GIF	Damped impulse twist, damping time = 120 seconds
IMPDMP1200_yyddd_s.GIF	Damped impulse twist, damping time = 1200 seconds
IMPSEC005_yyddd_s.GIF	Damped impulse twist, apply impulse for 5 seconds
IMPSEC240_yyddd_s.GIF	Damped impulse twist, apply impulse for 240 seconds
IMPSEC2400_yyddd_s.GIF	Damped impulse twist, apply impulse for 2400 seconds

4.8.2 Observed Results

This Section lists the factors that were considered, and their contributions to the appearance of the plots delineated in Sections 4.6.1, 4.7.1, and 4.8.1.

4.8.2.1 Day of Year

The results, even the appearance of the baseline plots, vary with the day number. The prepfiles for Days 2000-004, 2000-005, 2000-008, 2000-010, 2000-016, 1999-356, and 1999-363 exhibit oscillations in the baseline curves like those of the continual-twist case. The rest show weaker oscillations in varying degrees, as in Figure 48 for Day 1999-357. It is worth repeating that there is one data file per day of year.

However, the plots with all twist types look similar for all days, since the twist effects overshadow the individuality evident in the baseline plots. Moreover, these plots contain

pronounced oscillations. Thus it is easy to see that all days exhibit the same pattern of peaks and troughs with the same periodicity, except for differences between days of no-data zones, artifacts, curve bumps, and spikes. There is also a little time shift between one day and the next. Specifically, there are 447 such curve cycles in about 45,520 minutes so that the average cycle lasts 101.8 minutes. Since 1440/101.8 = 14.16, the remainder of 0.16 (out of a possible 1.0) confirms the fact that the daily shift takes 5 to 7 days to accumulate to one full cycle. Indeed, the established average period has been shown to be 6000 to 6200 seconds (100 to 103.33) minutes (see [*Cook, et al.*, 1997b]). In summary, the oscillations are orbital periodic, not dependent on the time of day.

4.8.2.2 Time of Day

The time of day on the horizontal axes of all graphs is Universal Time. No unexplained phenomena are observed in the time domain in these experiments; hence the UT does not influence the results of these experiments.

4.8.2.3 Continual-Twist Angle A

The values A = 1, 5, 10, and 30degrees show that multiplying the twist angle by the factor N multiplies the curve amplitudes of Y and Z also by N. However, curve X remains identical.

4.8.2.4 Continual-Twist Angle B

The values B = 1, 5, 10, and 30degrees show that multiplying the twist angle by N multiplies the curve amplitudes of X and Z also by N. However, curve Y remains identical.

4.8.2.5 Continual-Twist Angle C

The values C = 1, 5, 10, and 30degrees show that multiplying the twist angle by N multiplies the curve amplitudes of X and Y also by N. However, curve Z remains identical.

4.8.2.6 Maximum Heat-Induced Angle

These plots show that multiplying the maximum heat angle PMAX by N multiplies the amplitudes of all curves (X, Y, and Z) by approximately N. However, when PMAX is much greater than 30 degrees, the growth of the amplitude is slower.

4.8.2.7 Maximum Impulse Angle

These plots show that the height (or depth) of each impulse on all three axes is proportional to the maximum impulse angle. However, when PMAX is much greater than 30 degrees, the growth of the impulse is slower.

4.8.2.8 Damping Time

Lowering the damping time from its default 30 seconds to 5 seconds cuts the average impulse height by about 40 percent. The impulse height is slightly larger for 10 seconds than for 5. At 120 seconds, there are more artifacts and the larger impulses thicken and are transformed from stick-like protrusions to A's; i.e. with a slight gap between the left and right ends of the spike. At 1200 seconds, there are fewer artifacts than at 120, but the spikes are much shorter, a few of them disappearing into the curve.

4.8.2.9 Duration of Applied Impulse

The plot in which each impulse lasts for 240 seconds appears similar to the plot for 5 seconds. However, the 2400-second plots show fewer spikes on all curves. In other words, increasing the time of application END_IMP of impulses does little except to reduce the number of spikes when the impulses last a very long time.

The reader might wish to review the damped-impulse paragraph near the end of Section 4.6.2.1 and the fact that each orbit lasts 100 to 104 minutes (Section 4.8.2.1). This information is needed for the next paragraph.

In the case of a damping time near 1200 seconds, the impulses become smaller but are all still present. However, the impulse duration END_IMP = 2400 seconds totally lacks the day-night terminator-crossing impulses seen at END_IMP = 5 and END_IMP = 240 for which the spikes in curves Y and Z are large compared to the other spikes. When END_IMP = 240 seconds (= 4 minutes), each impulse ends before the next one starts one-quarter orbit (about 25 to 26 minutes) later. However, at END_IMP = 2400 seconds (= 40 minutes), the first impulse (which is equatorial) is still active when the satellite crosses the terminator. Thus, the terminator impulse can not be started, but the following equatorial one can, since it starts 51 to 52 minutes (one-half orbit), over 40 minutes after the first impulse. The impulse recording continues in this fashion so that only the equatorial spikes are plotted.

4.8.3 Summary of Results of Factor Analysis

The results of this study lead to the following general observations.

1) Unlike the Universal Time, the day number influences the results. This influence is reflected in variations of amplitude of the baseline curves for the different days.

2) Multiplying an angle (A, B, or C) by N does not influence its corresponding curve, but multiplies the amplitude of each of the other two curves by a factor equal to, or approximately, N. For example, multiplying A by N leaves the X-curve alone, but multiplies the amplitudes of Y and Z by N. For a proof of this observation, see Section 4.8.4.1.

3) Multiplying the maximum heat angle by N multiplies the amplitudes of curves X, Y, and Z by N. For proof, see Section 4.8.4.2.

4) Multiplying the maximum impulse angle by N multiplies the heights of the plotted spikes on axes X, Y, and Z by N. For proof, see Section 4.8.4.3.

5) Multiplying the damping time by N raises the impulse height, but by a factor less than N. Moreover, the impulse height actually *decreases* with damping time as the latter quantity grows near 1200 seconds. As the damping time increases, the spikes thicken and split apart at the bottom. For proof, see Section 4.8.4.4.

6) Increasing the time of application of impulses does little except to reduce the number of spikes when each impulse lasts over 25 to 26 minutes. For proof, see Section 4.8.2.9 above.

4.8.4 Proofs of Results of Factor Analysis

This Section provides mathematical proofs of several observations listed above in Section 4.8.3. Observations 2, 3, 4, and 5 are proven below in Sections 4.8.4.1, 4.8.4.2, 4.8.4.3, and 4.8.4.4, respectively. Observation 1 is obvious and therefore needs no proofs. Observation 6 was already proven above in Section 4.8.2.9.

4.8.4.1 Proof of Linearity between Continual-Twist Angles and Curve Amplitudes

This Section proves Observation 2 above, that multiplying a continual-twist angle by N leaves its corresponding curve alone, but multiplies the amplitudes of the other two curves by N.

In Subroutine APSM_OSCILLATION, the vector:

$$V = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \tag{18}$$

is multiplied on the left by $R_A R_B R_C$ to obtain $R_A R_B R_C V$. R_A is the rotation matrix that rotates a vector A degrees in the YZ plane, R_B B degrees in the XZ plane, and R_C C degrees in the XY plane. That is,

$$R_A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & cA & sA \\ 0 & -sA & cA \end{bmatrix}, \quad R_B = \begin{bmatrix} cB & 0 & -sB \\ 0 & 1 & 0 \\ sB & 0 & cB \end{bmatrix}, \quad R_C = \begin{bmatrix} cC & sC & 0 \\ -sC & cC & 0 \\ 0 & 0 & 1 \end{bmatrix}, \tag{19}$$

where:
cA, cB, and cC are shorthand for $\cos(A\pi/180)$, $\cos(B\pi/180)$, and $\cos(C\pi/180)$, respectively, and sA, sB, and sC are shorthand for $\sin(A\pi/180)$, $\sin(B\pi/180)$, and $\sin(C\pi/180)$, respectively. The $\pi/180$ adjustment is due the fact that A, B, and C are the twist angles in degrees, not radians.

The above rotation produces the measured vector. From this result we subtract the modeled vector, which is theoretically the original vector V, to obtain the 3x1 measured-minus-modeled vector that is written into the output MFR file. Let this vector be called W. To simplify our

calculation of W, we ignore filtering and further adjustments between the above subtraction and the time W is written into the MFR file.

In the baseline case W = V - V = 0. However, in the oscillation case, we obtain $W = R_AR_BR_CV - V = (R_AR_BR_C - I)V$, where I is the 3x3 identity matrix. In the general case,

$$W = \begin{bmatrix} (cBcC - 1)x + cBsCy - sBz \\ (sAsBcC - cAsC)x + (sAsBsC + cAcC - 1)y + sAcBz \\ (cAsBcC + sAsC)x + (cAsBsC - sAcC)y + (cAcB - 1)z \end{bmatrix}. \quad \textbf{(20)}$$

Let the three components of W be w_1, w_2, and w_3. We now prove that A does not influence w_1, but that multiplying A by a factor N results in multiplying w_2 and w_3 by N. That A does not change w_1 is obvious. The second statement is proved as follows.

The first step is to evaluate the Taylor-series expansions of s(A), s(NA), c(A), and c(NA). The first two terms of each are:

$$s(A) = \sin(A\pi/180) \approx A\pi/180 - \frac{(A\pi/180)^3}{3!} \quad \textbf{(21)}$$

$$s(NA) = \sin(NA\pi/180) \approx NA\pi/180 - N^3\frac{(A\pi/180)^3}{3!} \quad \textbf{(22)}$$

$$c(A) = \cos(A\pi/180) \approx 1 - \frac{(A\pi/180)^2}{2!} \quad \textbf{(23)}$$

$$c(NA) = \cos(NA\pi/180) \approx 1 - N^2\frac{(A\pi/180)^2}{2!} \quad \textbf{(24)}$$

For all studies in the F15 experiment, the maximum value of NA is 30. Thus, the highest-magnitude ratio of second term to first term in the above four Taylor expansions is

$$\frac{N^2A^2\left(\frac{\pi}{180}\right)^2}{2} < \frac{N^2A^2\left(\frac{10}{32400}\right)}{2} = \frac{N^2A^2}{6480} \le \frac{900}{6480} = \frac{1}{7.2}, \quad \textbf{(25)}$$

so that we can always ignore the second term. Therefore, we can assume that s(NA) = Ns(A) and c(NA) = 1.

If we keep B = C = 0 and allow N to vary, then $R_B = R_C = I$ so that

$$W = (R_{NA} - I)V = \begin{bmatrix} 0 & 0 & 0 \\ 0 & c(NA)-1 & s(NA) \\ 0 & -s(NA) & c(NA)-1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} \approx \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & NsA \\ 0 & -NsA & 0 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} \approx \begin{bmatrix} 0 \\ NsAz \\ -NsAy \end{bmatrix} = N\begin{bmatrix} 0 \\ sAz \\ -sAy \end{bmatrix} \quad \textbf{(26)}$$

Thus, multiplying A by N leaves the first component of W alone, but multiplies the last two components by N.

Similarly, if we multiply B by N and keep A = C = 0, then $R_A = R_C = I$ so that

$$W=(R_{NB}-I)V=\begin{bmatrix} c(NB)-1 & 0 & -s(NB) \\ 0 & 0 & 0 \\ s(NB) & 0 & c(NB)-1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} \approx \begin{bmatrix} 0 & 0 & -NsB \\ 0 & 0 & 0 \\ NsB & 0 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} \approx \begin{bmatrix} -NsBz \\ 0 \\ NsBx \end{bmatrix} = N\begin{bmatrix} sBz \\ 0 \\ sBx \end{bmatrix}. \tag{27}$$

That is, w_2 is left alone, but w_1 and w_3 are multiplied by N.

If we multiply C by N and keep A = B = 0, then $R_A = R_B = I$ so that

$$W=(R_{NC}-I)V=\begin{bmatrix} c(NC)-1 & s(NC) & 0 \\ -s(NC) & c(NC)-1 & 0 \\ 0 & 0 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} \approx \begin{bmatrix} 0 & NsC & 0 \\ -NsC & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} \approx \begin{bmatrix} NsCy \\ -NsCx \\ 0 \end{bmatrix} = N\begin{bmatrix} sCy \\ -sCx \\ 0 \end{bmatrix}. \tag{28}$$

Here w_3 is left alone, but w_1 and w_2 are multiplied by N.

We have just proven that multiplying any angle by N and keeping the other angles zero does not influence the curve corresponding to the multiplied angle, but multiplies the amplitudes of the other curves by N. This is Observation 2 in Section 4.8.3 above.

4.8.4.2 Proof of Linearity between Thermal-Twist Angle and Curve Amplitudes

This Section proves Observation 3 above, that multiplying the heat-induced twist angle by N multiplies the amplitudes of the all three curves by N.

Subroutine APSM_THERMAL merely rotates the measured-field vector:

$$V=\begin{bmatrix} x \\ y \\ z \end{bmatrix} \tag{29}$$

in the XY, XZ, and YZ planes by the angle:

$$H \equiv \left(1-\frac{LAT}{LAT\_ABS}\right)\frac{PMAX}{2} \tag{30}$$

where:

LAT	=	present latitude of satellite
LAT_ABS	=	maximum absolute value of the satellite latitude
PMAX	=	selected value of maximum twist

We wish to prove that multiplying PMAX by N multiplies the amplitudes of all three measured-minus-modeled curves by N. Indeed, multiplying PMAX by N increases the angle from H to NH. Now let cH, c(NH), sH, and s(NH) equal cos(Hπ/180), cos(NHπ/180), sin(Hπ/180), and sin(NHπ/180), respectively. Denote the squares of these quantities as c^2H, c^2(NH), s^2H, and s^2(NH), respectively. Similarly, represent the cubes as c^3H, c^3(NH), s^3H, and s^3(NH). Then for PMAX*N the measured-minus-modeled vector W equals:

$$W=\begin{bmatrix} (c^2(NH)-1)x+c(NH)s(NH)y-s(NH)z \\ (s^2(NH)c(NH)-c(NH)s(NH))x+(s^3(NH)+c^2(NH)-1)y+s(NH)c(NH)z \\ (c^2(NH)s(NH)+s^2(NH))x+(c(NH)s^2(NH)-s(NH)c(NH))y+(c^2(NH)-1)z \end{bmatrix}$$

$$\approx\begin{bmatrix} Ns(H)y-Ns(H)z \\ (N^2s^2(H)-Ns(H))x+N^3s^3(H)y+Ns(H)z \\ (Ns(H)+N^2s^2(H))x+(N^2s^2(H)-Ns(H))y \end{bmatrix} \qquad \textbf{(31)}$$

$$\approx\begin{bmatrix} Ns(H)y-Ns(H)z \\ -Ns(H)x+Ns(H)z \\ Ns(H)x-Ns(H)y \end{bmatrix}=N\begin{bmatrix} s(H)y-s(H)z \\ -s(H)x+s(H)z \\ s(H)x-s(H)y \end{bmatrix},$$

where we use the Taylor-series approximations c(NH) = 1 and s(NH) = Ns(H) to derive the second line.

To derive the third line, we treat all occurrences of N^2s^2 (H) and N^3s^3(H) as zero, since the largest term in their Taylor-series expansions is

$$\left(\frac{NH\pi}{180}\right)^2 \le \left(\frac{30\pi}{180}\right)^2 = \left(\frac{30}{180}\right)^2 \pi^2 = \frac{\pi^2}{36} < \frac{10}{36} \qquad \textbf{(32)}$$

which is small compared to 1. Here, we use the facts that the maximum thermal twist NH we use is 30 degrees and $\pi^2 < 10$.

Thus, we just proved that multiplying PMAX by N effectively multiplies each component of W by approximately N. This is Observation 3 in Section 4.8.3 above.

4.8.4.3 Proof of Linearity between Impulse Angle and Spike Heights

This Section proves Observation 4 above, that multiplying the maximum impulse angle by N multiplies the heights of the plotted spikes on all three axes by N.

Here in Subroutine APSM_IMPULSE, the angle of rotation = PMAX*exp(-αS), where S = amount of time elapsed since the impulse was first applied. Since exp(-αS) is independent of

PMAX, the angle of rotation is always a multiple of PMAX. Except for the definition of this angle, APSM_IMPULSE uses the same algorithm as does APSM_THERMAL. Moreover, the upper limit of the angle in APSM_IMPULSE is 30 degrees like in APSM_THERMAL. Thus, the proof of Section 4.8.4.2 applies here, so that multiplying PMAX by N multiplies the amplitude of each curve, which is the height of each spike, by approximately N. This is Observation 4 in Section 4.8.3 above.

4.8.4.4 Proof of Statements about Damping Time of Impulse

Observation 5 above consists of three statements to be proved in this Section. They are repeated below for your review, then proved one at a time.

A) Multiplying the damping time by N raises the impulse height, but by a factor less than N.
B) The impulse height decreases with damping time as the latter grows above 1200 seconds.
C) As the damping time increases, the spikes thicken and split apart at the bottom.

Proof:

According to Subroutine APSM_IMPULSE, wherever an impulse occurs on the plotted curves, the measured-field vector is rotated as in Section 4.8.4.2 above by the impulse angle in all three dimensions. This angle is PMAX*exp(-αS) = PMAX*exp(-LS/T) where:

PMAX = maximum impulse angle (in degrees),
L = ln(50),
S = number of seconds since start of impulse
where $0 \le S <$ END_IMP and END_IMP = duration of impulse in seconds, and
T = damping time in seconds.

If we let J = the above rotation angle, then rotating the measured-field vector by J yields the measured-minus-field vector

$$W=\begin{bmatrix} (c^2(J)-1)x+c(J)s(J)y-s(J)z \\ (s^2(J)c(J)-c(J)s(J))x+(s^3(J)+c^2(J)-1)y+s(J)c(J)z \\ (c^2(J)s(J)+s^2(J))x+(c(J)s^2(J)-s(J)c(J))y+(c^2(J)-1)z \end{bmatrix}$$

$$\approx\begin{bmatrix} s(J)y-s(J)z \\ (s^2(J)-s(J))x+s^3(J)y+s(J)z \\ (s(J)+s^2(J))x+(s^2(J)-s(J))y \end{bmatrix} \tag{33}$$

$$\approx\begin{bmatrix} s(J)y-s(J)z \\ -s(J)x+s(J)z \\ s(J)x-s(J)y \end{bmatrix}=s(J)\begin{bmatrix} y-z \\ z-x \\ x-y \end{bmatrix}\approx\frac{J\pi}{180}\begin{bmatrix} y-z \\ z-x \\ x-y \end{bmatrix}=\frac{\pi}{180}PMAXe^{-\frac{LS}{T}}\begin{bmatrix} y-z \\ z-x \\ x-y \end{bmatrix},$$

where we use the same notation as in Section 4.8.4.2. Theoretically, the impulse height equals the peak value of W, which occurs when S = 0 and is thus independent of T. On the other hand, the impulse height plotted is the highest point on the impulse based on the data from the output

MFR file. Let the impulse height be called W_{max}, which = W for some value S_{max} of S. S_{max} is almost always somewhat *greater* than zero, so the above plotted impulse height *does* increase as T becomes larger.

To prove Statement A, it remains to show that W_{max} increases by a factor less than N if we replace T with NT. In this case, from the above equation this factor increase is:

$$\frac{\frac{\pi}{180}PMAXe^{-\frac{LS}{NT}}}{\frac{\pi}{180}PMAXe^{-\frac{LS}{T}}}=\frac{e^{-\frac{LS}{NT}}}{e^{-\frac{LS}{T}}}=e^{\left(\frac{LS}{T}-\frac{LS}{NT}\right)}=e^{\frac{LS}{T}\left(1-\frac{1}{N}\right)}=50^{\frac{S}{T}\left(1-\frac{1}{N}\right)}\leq 50^{\frac{1}{5}\left(1-\frac{1}{N}\right)}<2.5^{\left(1-\frac{1}{N}\right)}\leq 2.5, \quad \textbf{(34)}$$

where we use the fact that L = ln(50). We also assume that T = 5, its starting value, and that $S \leq 1$. This latter assumption is valid since the times in the MFR file are one second apart, so surely one of them is within 1 second of the time when S = 0. For N > 2.5 the above factor increase is obviously less than N. In fact, no matter how large N becomes, this increase never treads beyond 2.5. For the minimal value N = 1, the increase factor is 1 and its derivative with respect to N is:

$$\frac{d}{dN}\left(e^{\frac{LS}{T}\left(1-\frac{1}{N}\right)}\right)=\frac{LS}{TN^2}e^{\frac{LS}{T}\left(1-\frac{1}{N}\right)}=\frac{LS}{T}\leq\frac{L}{5}=\frac{\ln(50)}{5}<1 \quad \textbf{(35)}$$

since exp(5) > 50. The second derivative of the increase factor for all $N \geq 1$ is:

$$\frac{d^2}{dN^2}\left(e^{\frac{LS}{T}\left(1-\frac{1}{N}\right)}\right)=\frac{d}{dN}\left(\frac{LS}{TN^2}e^{\frac{LS}{T}\left(1-\frac{1}{N}\right)}\right)=\frac{LS}{T}\left[\frac{d}{dN}\left(\frac{1}{N^2}e^{\frac{LS}{T}\left(1-\frac{1}{N}\right)}\right)\right]$$

$$=\frac{LS}{T}\left[\frac{1}{N^2}\left(\frac{LS}{TN^2}e^{\frac{LS}{T}\left(1-\frac{1}{N}\right)}\right)-\frac{2}{N^3}\left(e^{\frac{LS}{T}\left(1-\frac{1}{N}\right)}\right)\right]=\frac{LS}{T}\left(\frac{LS}{TN^4}-\frac{2}{N^3}\right)\left(e^{\frac{LS}{T}\left(1-\frac{1}{N}\right)}\right)<0, \quad \textbf{(36)}$$

since LS/T > 0, the exponent > 0, and the middle term is:

$$\frac{LS}{TN^4}-\frac{2}{N^3}<\frac{1}{N^4}-\frac{2}{N^3}=\frac{1}{N^4}(1-2N)<0. \quad \textbf{(37)}$$

Thus, for all N > 1 the first derivative of the increase factor is less than 1. Comparing the curve of the increase factor versus N with the straight line of N versus N (see Figure 30) shows that the increase factor equals N for N = 1 and is less than N for all N > 1. Thus, Statement A is proven.

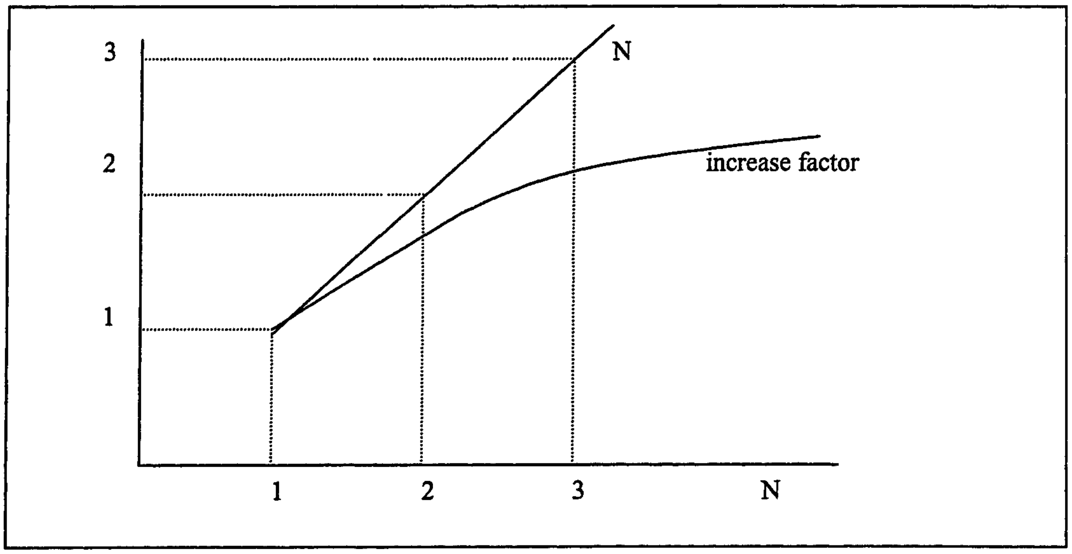


Figure 30. Comparing the Curve of the Increase Factor vs. N with the Straight Line of N vs. N.

To prove Statement B, we provide a theoretical explanation of why the impulse height shrinks when the damping time T becomes very large (close to 1200 seconds).

We observe that after Subroutine APSM_MEASURED_MINUS_MODEL is done, the measured-minus-modeled impulse magnitudes for each of the directions Y and Z have the same initial height for T = 1200 and T = 60, but disappear more quickly into the baseline for T = 60 than for T = 1200.

The next subroutine that APSM.F calls, namely APSM_REMOVE_LARGE_JUMPS, treats each impulse as a large jump (over 375 nT) and subtracts the same amount from the X-curve for the entire duration of the impulse, in an attempt to cause this impulse to vanish in magnitude. In most cases, this amount is approximately the initial impulse height. Hence, the subtracted amount is based on the initial impulse angle and therefore independent of the damping time T. Hence, it is the same for T = 60 as for T = 1200. A similar operation is done for curves Y and Z. This operation has the effect of turning the impulse upside-down and setting its left-hand end close to zero. Since the original impulse drops faster for T = 60 than for T = 1200, the inverted impulse rises faster for T = 60. Thus, its peak, now on its right-hand end, is higher for T = 60 than for T = 1200.

Although the large-jump removal is an important factor in reducing the impulse heights for T = 1200, the remaining routines that APSM.F calls produce the measurements that appear in the plots.

Statement C focuses on the width of the spike on the plot. In theory, this width is directly proportional to its duration END_IMP and thus independent of the damping time T, and the impulse resembles the left-hand figure in Figure 31 below. This figure is accurate when T is large, say T = 60. However, the closer T is to zero, the less time the impulse takes to return close to the baseline curve and the lower the amplitude is when the impulse ends after END_IMP

seconds. When T is small enough, between 5 and 10, the impulse resembles the single pole in the right-hand figure below.

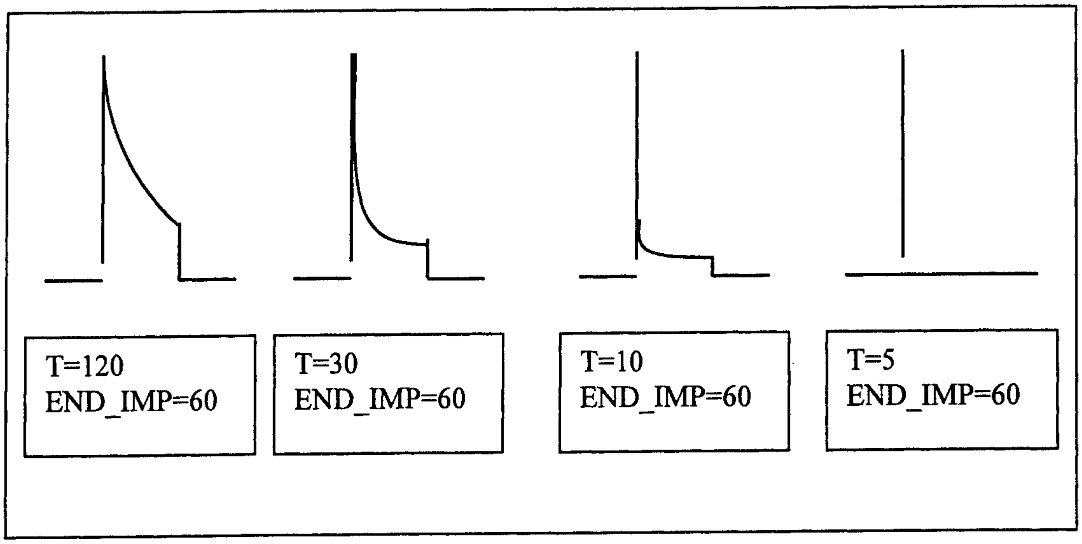


Figure 31. Effect of Damping Time on Impulse Spike Duration.

Thus, as T increases, the spikes split at the bottom. In addition, more data points are high enough from the baseline curve to be seen on the spikes, not on the baseline. Hence, the spikes are thicker. This proves Statement C.

4.9 Decomposing The Boom Effect

The goal of this Section is to express the effect of adding the boom as the sum of the three factors that conceivably twist the boom. These three factors are continual oscillation, sun-induced thermal twist, and impulse twist. This decomposition is done for each of the six sample days listed above in Section 4.5.1. From these results, conclusions are then deduced for the entire six-month period covered by the sample days. This decomposition is supposed to determine the effect of the behavior of the boom on the field strength.

For a mathematical definition of the boom effect and the three twists, see Sections 4.4.1 and 4.4.2 above. Section 4.9.1 details a method that decomposes the baseline curves analytically by a linear least-squares method. Section 4.9.2 discusses another method of decomposition: visually comparing plots of the baseline curves with graphs of the twist effects. Section 4.9.3 summarizes the results of this study.

The main results of this study are as follows: The method of visual inspection, especially when applied to the Fourier-transform (FT) plots, yields more information about the decomposition of the baseline than does the mathematical method. The FT plots indicate that the continual and thermal twists are the predominant twist components in the baseline curve.

4.9.1 Mathematical Decomposition of the Baseline Curves

It was first thought that a mathematical method would provide a precise decomposition of the baseline curve W. However, this method decomposes only a small part of W, leaving the rest as a combination of artifacts, noise, and other errors. Nevertheless, this method is illustrated here.

This Section is outlined as follows:

Section 4.9.1.1 introduces the least-squares equation used in the mathematical attempt at decomposition.

Section 4.9.1.2 records the least-squares solutions when the samples of magnetic fields are ordered by Universal Time, about one sample per second. Section 4.9.1.3 lists the solutions when these samples are ordered by satellite altitude. This reordering is done to see whether the altitude solutions reveal similarities not noticed in the time solutions. Similarly, Section 4.9.1.4 reorders the data points by latitude.

Section 4.9.1.5 rearranges them by amount of sunlight. This variable is set = 0 when the satellite crosses the day-night terminator from night to day, and = 1 when it passes from day to night. When the satellite does not cross the terminator, this variable is linearly interpolated between 0 and 1 according to the distance of the satellite from its closest night-to-day crossing point.

Section 4.9.1.6 repeats the analyses of Sections 4.9.1.2 through 4.9.1.5, but this time converting the magnetic field to its Fourier transform and plotting it over the time frequency, which has units of Hz (= 1/sec).

Section 4.9.1.7 summarizes the results of the above analysis.

4.9.1.1 The Least-Squares Equation

Since the goal of decomposition is to minimize the part of W that does not belong to a twist type, a linear least-squares method is used.

The boom effect ($F15_{meas}$ - $F15_{mod}$), defined in Section 4.5.3 above, is computed for each axis (X, Y, and Z) for each of N data points, typically one second apart. The resulting vector with 3N components, when plotted, forms the baseline curve. This curve is then decomposed into its twist types by a linear least-squares solution of the equation:

$$W = c_T T_5 + c_I I_5 + osc(A,B,C) + R \qquad \textbf{(38)}$$

for the set of five unknown scalar constants c_T, c_I, A, B, and C that minimizes the square norm $|R|_2$ of the residual R. $|R|_2$ is defined as the square root of the sum-of-squares of its 3N components. In other words, if $R = (r_1, r_2, ..., r_{3N})$ then $|R|_2 = SQRT(r_1^2 + r_2^2 + ... + r_{3N}^2)$. This residual theoretically contains artifacts, noise, and other errors.

W, T_5, I_5, osc(A,B,C), and R are vectors, each with 3N components that correspond to axes X, Y, and Z for each of N data points.

W is the baseline vector, the boom effect ($F15_{meas}$ - $F15_{mod}$) defined above, where:
$F15_{meas}$ = measured-field vector for F15 with the above 3N components, and
$F15_{mod}$ = modeled-field vector for F15 with the above 3N components.

The three twist types are T_5, I_5, and osc(A,B,C) as defined below:

T_5 = effect of thermal twist of 5 degrees = $THERM_5$* $F15_{meas}$ - $F15_{meas}$,
where $THERM_5$* $F15_{meas}$ = the vector with the above 3N components that results from applying the 3x3 rotation matrix for PMAX = 5 degrees in APSM_THERM.F to each data point of $F15_{meas}$. Each data point is represented as a vector of 3 components corresponding to axes X, Y, and Z.

I_5 = impulse twist of 5 degrees = $IMPUL_5$* $F15_{meas}$ - $F15_{meas}$,
where $IMPUL_5$* $F15_{meas}$ = the vector with the above 3N components that results from applying the rotation matrix for PMAX = 5 degrees in APSM_IMPUL.F to each data point of $F15_{meas}$.

osc(A,B,C) = estimated continual-oscillation twist of A, B, and C degrees. For each data point, this twist is approximated as the three-component vector:

$$[p(Cy - Bz),\ p(Az - Cx),\ p(Bx - Ay)], \text{ where} \tag{39}$$

p = pi/180, the conversion factor from degrees to radians, and
(x, y, z) = the three-component vector for one data point of $F15_{meas}$.

4.9.1.2 Field Versus Time

An IDL program was created to plot the magnetic field versus time for the F15 measured-minus-modeled (baseline), thermal, and impulse outputs. This program also performs the least-squared analysis described in Section 4.9.1.1 above, mathematically decomposing the baseline curve into its component twist types.

For each of the six sample days of data, Tables 12 through 23 list the solution coefficients c_T, c_I, A, B, and C that minimize the residue norm $|R|_2$. Below these coefficients also appear $|R|_2$ itself, the norm $|W|_2$ of the baseline vector W, and the ratio $|R|_2/|W|_2$ that provides a true measure of the non-decomposed part of W. The domain over which the field is plotted appears in the upper-left corner of the next twelve tables. For example, Table 12 contains its domain "Time" in its upper-left corner.

TABLE 12. Coefficients of Components of the Baseline Curve as a Function of Time						
Time	Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
c_T	0.003256	-0.009423	-0.011347	-0.034203	-0.036265	-0.023273
c_I	-0.007086	-0.014733	0.040358	0.027719	0.005215	0.000640
A	-0.011169	0.035353	0.036364	0.138719	0.146984	0.070963
B	-0.067365	-0.003893	0.027024	0.021608	0.046335	0.053667
C	0.001566	-0.011807	-0.015181	0.074791	0.084324	0.035953
$\|R\|_2$	129.84918	140.16919	131.83162	136.17054	129.71414	139.08746
$\|W\|_2$	131.03552	141.10848	132.87787	139.87960	133.04027	140.09419
$\|R\|_2/\|W\|_2$	0.990946	0.993343	0.992126	0.973484	0.974999	0.992814

The baseline curve and its component twists can be translated from the coefficients in the above table into units of NanoTesla (nT). The following example illustrates how this is done.

Running the prepfile for Day 2000-050 through APSM with no twists (the baseline curve) yields W in its MFR (measured-minus-modeled field record) file. The maximum absolute value of the field in this file is 513 nT, 433 nT, and 509 nT for axes X, Y, and Z, respectively.

The next step is to obtain the magnitude of the thermal component of W. To do so, one must multiply the thermal coefficient c_T by the maximum absolute value of the field of the thermal twist T_5 of 5 degrees. Now:

$$
\begin{aligned}
T_5 &= \text{effect of thermal twist of 5 degrees} \\
&= THERM_5 * F15_{meas} - F15_{meas} \qquad (40) \\
&= (THERM_5 * F15_{meas} - F15_{mod}) - (F15_{meas} - F15_{mod}) \\
&= (THERM_5 * F15_{meas} - F15_{mod}) - W.
\end{aligned}
$$

The quantity ($THERM_5 * F15_{meas} - F15_{mod}$) appears in the MFR file that results by running Day 2000-050 through APSM with the call to Subroutine APSM_THERMAL turned on and PMAX set to 5.0*DEG_TO_RAD in Subroutine APSM_THERMAL. The field values of the baseline-curve MFR file, which form W, are then subtracted from those of the thermal-twist MFR file. The maximum absolute value of the resulting field is 1624 nT, 3602 nT, and 4687 nT for axes X, Y, and Z, respectively. Multiplying these three values by the absolute value of the thermal-twist coefficient $|c_T| = 0.003256$ yields the magnitude (5.28774 nT, 11.7281 nT, 15.2609 nT) of the thermal-twist component in the baseline curve.

Similarly, once the continual-twist angles A, B, and C are known, osc(A,B,C) can be written as:

$$
\begin{aligned}
osc(A,B,C) &= \text{effect of continual twist with angles A, B, and C} \\
&= OSC_{A,B,C} * F15_{meas} - F15_{meas} \\
&= (OSC_{A,B,C} * F15_{meas} - F15_{mod}) - (F15_{meas} - F15_{mod}) \qquad (41) \\
&= (OSC_{A,B,C} * F15_{meas} - F15_{mod}) - W,
\end{aligned}
$$

where $OSC_{A,B,C}$ = the rotation matrix

where $OSC_{A,B,C} * F15_{meas}$ = the vector with 3N components that results from applying the 3x3 rotation matrix for angles A, B, and C degrees in Subroutine APSM_OSCILLATION to each data point of $F15_{meas}$. One should run Day 2000-050 through APSM with the call to

APSM_OSCILLATION turned on and the angles (A, B, C) in this subroutine set to (-0.011169 deg, -0.067365 deg, 0.001566 deg) as indicated in the above table. Taking the field values in the resulting MFR file and subtracting those of W yield the continual-twist effect. Its maximum absolute values are 14 nT, 3 nT, and 53 nT for axes X, Y, and Z, respectively. They do not need to be multiplied by any coefficient, since osc(A,B,C) has none in the equation:

$$W = c_T T_5 + c_I I_5 + osc(A,B,C) + R. \qquad \textbf{(42)}$$

The measurements (in nT) of **maximum** absolute value of magnetic field in the baseline curve and in its component twists appear in the Table 13.

TABLE 13. Maximum Contributions of Components of the Baseline Curve as a Function of Time

Maximum absolute value of field over time		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	513	523	521	519	541	542
	Y	433	506	494	547	641	973
	Z	509	703	447	613	444	677
Thermal part of W	X	5.28774	13.7576	17.3609	55.4773	60.3812	36.8179
	Y	11.7281	36.6743	42.7782	122.447	129.140	85.2490
	Z	15.2609	41.3199	45.3199	142.832	152.784	94.7909
Impulse part of W	X	16.4324	34.4169	91.4109	66.0267	11.2488	1.50336
	Y	23.0082	54.3500	144.159	106.441	17.5850	2.21952
	Z	31.2422	60.7442	147.872	108.354	21.3085	2.41344
Continual -twist part of W	X	14	6	10	37	43	22
	Y	3	13	16	74	82	37
	Z	53	17	27	67	78	53

For Day 2000-050, the impulse and continual twists are stronger components of the baseline curve than is the thermal twist. For Days 2000-083 and 2000-116, the strongest component is the impulse twist, which because of its spikes, is more prevalent in Table 13 than in the Table 14, that lists the average field intensities. For the remaining three days, the thermal twist is strongest.

The measurements (in nT) of **average** absolute value of magnetic field in the baseline curve and in its component twists appear in the Table 14.

TABLE 14. Average Contributions of Components of the Baseline Curve as a Function of Time							
Average absolute value of field over time		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	141.543	144.394	146.038	142.480	138.339	146.486
	Y	88.2904	109.094	88.3712	97.5812	94.5259	96.4692
	Z	82.1530	83.2034	80.8719	93.1343	83.1404	81.6874
Thermal part of W	X	1.93118	5.32780	6.59117	19.4813	20.7803	13.3036
	Y	3.41671	10.9594	12.7251	38.6269	41.7518	26.3020
	Z	4.19699	12.1972	15.4678	45.6573	48.8749	31.3868
Impulse part of W	X	0.10160	0.09452	0.38505	0.20242	0.05088	0.00465
	Y	0.24251	1.98383	1.46565	4.13785	0.26929	0.03478
	Z	0.36439	1.29340	2.94734	0.93750	0.30873	0.04604
Continual -twist part of W	X	4.80394	2.63877	3.86903	16.6782	18.8624	8.64912
	Y	1.11646	5.47576	7.17997	34.0360	38.3940	16.3082
	Z	30.1159	8.10999	14.6066	32.2747	38.8426	28.9119

For Day 2000-050, the continual twist is predominant. For the remaining days, the thermal twist is strongest.

The coefficients c_T, c_I, A, B, and C tabulated in the "Time" table above determine how well W can be decomposed into its component twists. Since the thermal and impulse twists T_5 and I_5 are taken at 5 degrees, their true effect is 5 times their coefficients c_T and c_I. Thus, for (say) Day 2000-050, the oscillation in W is made up as follows:

Thermal: 12.4 percent
Impulse: 26.9 percent
Continual oscillation: 60.8 percent, composed of:
- Angle A: 8.5 percent
- Angle B: 51.1 percent
- Angle C: 1.2 percent

Because of roundoff error, the above percentages add up to 100.1 percent.

According to the coefficient values, the predominant twist in the baseline curve for Day 2000-050 is Angle B of the continual twist. For Days 2000-083 and 2000-116, the impulse twist is strongest. For the remaining three days, the thermal twist prevails. These findings match the pattern of prevalent twists for the maximum absolute value of the field in nT.

The results in Table 14 above, and in all tables that record $|R|_2$ and $|W|_2$, show that $|R|_2$ is always between 95 percent and 100 percent of $|W|_2$. This proximity strongly suggests that for most days between Days 2000-050 and 2000-215, if not all, R and W are almost equal, most often less than 10 percent different and pointing in the same direction. Hence, the sum (W - R) of the twist types contains very little of these types. Thus, it is difficult to decompose W into the various twist types using the field-versus-time coefficients.

4.9.1.3 Field Versus Altitude

Another IDL program was designed to solve the least-squares equation for the field versus satellite altitude in the hope that these results, more than the conventional field-versus-time solutions, can reveal the makeup of oscillation types present in the field of W. This IDL program uses the QuickSort algorithm found on the *MVPS Website* [1997].

Table 15 lists the solutions and residual of field versus altitude.

TABLE 15. Coefficients of Components of the Baseline Curve as a Function of Altitude

Altitude	Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
c_T	-0.004284	-0.007883	-0.004026	-0.005560	-0.013783	-0.008057
c_I	0.008875	-0.010954	0.000554	0.008374	0.004035	0.001526
A	0.008441	0.013938	0.005814	0.061581	0.077105	0.014209
B	-0.049876	-0.013794	-0.004744	-0.066536	-0.023461	0.005900
C	0.016323	-0.021543	-0.039356	0.004228	0.019296	-0.005968
$\|R\|_2$	129.79314	140.07472	132.01088	137.77392	131.03256	139.64188
$\|W\|_2$	131.03476	141.10734	132.87704	139.87878	133.03949	140.09336
$\|R\|_2/\|W\|_2$	0.990525	0.992682	0.993482	0.984952	0.984915	0.996777

Again, $|R|_2$ is always a bit less than $|W|_2$. Hence, the field-versus-altitude solution does not break down a significant part of W.

In the altitude domain, as in the time domain, the baseline curve and its component twists can be translated from the coefficients in the above table into units of NanoTesla (nT). The measurements (in nT) of **maximum** absolute value of magnetic field in the baseline curve and in its component twists appear in Table 16 below.

TABLE 16. Maximum Contributions of Components of the Baseline Curve as a Function of Altitude

Maximum abs. value of field over altitude		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	513	523	521	519	541	542
	Y	433	506	494	547	641	973
	Z	509	703	447	613	444	677
Thermal part of W	X	6.95722	11.5092	6.15978	9.01832	22.9487	12.7462
	Y	15.4310	30.6806	15.1780	19.9048	49.0813	29.5128
	Z	20.0791	34.5670	16.0798	23.2186	58.0678	32.8162
Impulse part of W	X	20.5811	25.5885	1.25481	19.9469	8.70350	3.58457
	Y	28.8171	40.4093	1.97889	32.1562	13.6060	5.29217
	Z	39.1299	45.1633	2.02986	32.7340	16.4870	5.75455
Continual -twist part of W	X	13	12	19	14	11	4
	Y	13	17	31	16	28	6
	Z	39	13	5	60	41	8

For Days 2000-050 and 2000-083, the impulse twist is the strongest component among the three twists in the baseline curve. For Days 2000-116 and 2000-149, the strongest component is the continual twist. For the remaining two days the thermal twist is strongest.

The measurements (in nT) of **average** absolute value of magnetic field in the baseline curve and in its component twists appear in the Table 17.

TABLE 17. Average Contributions of Components of the Baseline Curve as a Function of Altitude

Average abs. value of field over altitude		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	141.543	144.394	146.038	142.480	138.339	146.486
	Y	88.2904	109.094	88.3712	97.5812	94.5259	96.4692
	Z	82.1530	83.2034	80.8719	93.1343	83.1404	81.6874
Thermal part of W	X	2.54090	4.45708	2.33860	3.16686	7.89784	4.60562
	Y	4.49545	9.16832	4.51497	6.27915	15.8683	9.10563
	Z	5.52209	10.2038	5.48808	7.42200	18.5756	10.8660
Impulse part of W	X	0.12725	0.07027	0.00529	0.06115	0.03937	0.01108
	Y	0.30374	1.47498	0.02012	1.25006	0.20836	0.08293
	Z	0.45638	0.96165	0.04046	0.28322	0.23887	0.10977
Continual -twist part of W	X	4.99973	4.88692	8.86488	4.81014	4.57254	1.38064
	Y	7.28034	9.53602	17.6743	4.12963	9.34535	2.81432
	Z	22.3101	7.00565	2.50148	32.9908	20.0380	4.13488

For Days 2000-050, 2000-116, and 2000-149, the continual twist is the strongest component among the three twists in the baseline curve. For the other three days the thermal twist is strongest. Like in field-over-time, the impulse twist in field-over-altitude is more prevalent among the maximum field intensities than among the average intensities.

According to the coefficient values, the predominant twist in the baseline curve for Days 2000-050 and 2000-149 is Angle B of the continual twist. For Days 2000-083, the impulse twist is strongest. For Day 2000-116, Angle C of the continual twist prevails. For Day 2000-182 it is Angle A of the continual twist. For Day 2000-215 it is the thermal twist. These findings somewhat resemble the pattern of prevalent twists for both the maximum and average absolute values of the field in nT.

4.9.1.4 Field Versus Latitude

Another IDL program was developed to decompose the baseline curve of the field versus satellite latitude.

This program uses the QuickSort algorithm found on the *MVPS Website* [1997].

Table 18 lists the solutions and residual of field versus latitude.

TABLE 18. Coefficients of Components of the Baseline Curve as a Function of Latitude						
Latitude	Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
c_T	-0.000140	-0.009422	-0.011345	-0.034204	-0.032898	-0.017275
c_I	-0.004560	-0.014734	0.040353	0.027719	0.004600	-0.008379
A	-0.000449	0.035349	0.036360	0.138721	0.127113	0.031651
B	-0.058823	-0.003897	0.027020	0.021610	0.036382	0.035385
C	0.009281	-0.011810	-0.015184	0.074792	0.074482	0.016726
$\|R\|_2$	129.86863	140.16810	131.83085	136.16958	129.80194	139.10287
$\|W\|_2$	131.03476	141.10734	132.87704	139.87878	133.03949	140.09336
$\|R\|_2/\|W\|_2$	0.991101	0.993344	0.992127	0.973483	0.975665	0.992930

Again, the field-versus-latitude coefficients do not properly decompose W.

The measurements (in nT) of **maximum** absolute value of magnetic field in the baseline curve and in its component twists appear in Table 19.

TABLE 19. Maximum Contributions of Components of the Baseline Curve as a Function of Latitude							
Maximum abs. value of field over latitude		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	513	523	521	519	541	542
	Y	433	506	494	547	641	973
	Z	509	703	447	613	444	677
Thermal part of W	X	0.227360	13.7561	17.3579	55.4789	54.7752	27.3291
	Y	0.504280	36.6704	42.7707	122.450	117.150	63.2783
	Z	0.656180	41.3155	45.3119	142.836	138.599	70.3611
Impulse part of W	X	10.5746	34.4186	91.3995	66.0267	9.92220	19.6823
	Y	14.8063	54.3537	144.141	106.441	15.5112	29.0584
	Z	20.1050	60.7483	147.853	108.354	18.7956	31.5972
Continual -twist part of W	X	13	6	10	37	38	11
	Y	8	13	16	74	72	17
	Z	46	17	27	67	66	32

For Day 2000-050, the continual twist is the strongest component among the three twists in the baseline curve. For Days 2000-083 and 2000-116, the strongest component is the impulse twist. For the remaining three days the thermal twist is strongest.

The measurements (in nT) of **average** absolute value of magnetic field in the baseline curve and in its component twists appear in Table 20.

TABLE 20. Average Contributions of Components of the Baseline Curve as a Function of Latitude							
Average abs. value of field over latitude		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	141.543	144.394	146.038	142.480	138.339	146.486
	Y	88.2904	109.094	88.3712	97.5812	94.5259	96.4692
	Z	82.1530	83.2034	80.8719	93.1343	83.1404	81.6874
Thermal part of W	X	0.08304	5.32723	6.59001	19.4819	18.8510	9.87491
	Y	0.14691	10.9583	12.7229	38.6280	37.8754	19.5234
	Z	0.18046	12.1959	15.4651	45.6586	44.3372	23.2977
Impulse part of W	X	0.06538	0.09452	0.38500	0.20242	0.04488	0.06085
	Y	0.15606	1.98396	1.46547	4.13785	0.23753	0.45538
	Z	0.23449	1.29349	2.94698	0.93749	0.27232	0.60270
Continual -twist part of W	X	4.57962	2.63952	3.86947	16.6784	16.6229	4.32892
	Y	4.13835	5.47652	7.18092	34.0364	33.9047	7.58078
	Z	26.2112	8.10955	14.6050	32.2754	32.7290	17.4400

For Day 2000-050, the continual twist is the strongest component among the three twists in the baseline curve. For the remaining days the thermal twist is strongest. Like in field-over-time, the impulse twist in field-over-latitude is more prevalent among the maximum field intensities than among the average intensities.

According to the coefficient values, the predominant twist in the baseline curve for Day 2000-050 is Angle B of the continual twist. For Days 2000-083 and 2000-116, the impulse twist is strongest. For the remaining three days, the thermal twist prevails. These findings match the pattern of prevalent twists for the maximum absolute value of the field in nT and for the coefficient values of the field-over-time plots.

4.9.1.5 Field Versus Sunlight

The next step is to decompose the baseline curve of the field versus sunlight, or "time spent in the Sun." The sunlight domain is important: since the thermal twist depends on the amount of sunlight, as defined below, the field-versus-sunlight plots can easily reveal similarities between the baseline and the thermal twist that the other domains (time, altitude, and latitude) fail to notice.

The amount of sunlight is a variable equal to 0 when the satellite crosses from night to day, and equal to 1 when it crosses from day to night. At all other times, this variable is interpolated linearly over time. For example, when the satellite is 1/4 of the way through the day Section of its orbit, the sunlight value = 1/4. At 1/3 of the way through its night Section, the sunlight value = 2/3.

This program uses the QuickSort algorithm found on the *MVPS Website* [1997].

Table 21 lists the solutions and residual of the field-versus-sunlight plots.

TABLE 21. Coefficients of Components of the Baseline Curve as a Function of Sunlight						
Sunlight	Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
c_T	-0.013399	-0.020636	-0.011347	-0.023001	-0.018286	-0.013833
c_I	0.003126	-0.003313	0.040358	0.021646	0.001532	-0.008150
A	0.026625	0.028225	0.036364	0.045331	0.049778	0.013781
B	-0.028032	0.019037	0.027024	-0.034246	-0.025193	0.016245
C	0.032050	0.000705	-0.015181	0.031024	0.024613	0.005323
$\|R\|_2$	129.17580	138.55130	131.83080	135.30046	129.97349	139.05892
$\|W\|_2$	131.03476	141.10734	132.87704	139.87878	133.03949	140.09336
$\|R\|_2/\|W\|_2$	0.985813	0.981886	0.992126	0.967269	0.976954	0.992616

Again, the field-versus-sunlight solution does not properly decompose W.

The measurements (in nT) of **maximum** absolute value of magnetic field in the baseline curve and in its component twists appear in Table 22.

TABLE 22. Maximum Contributions of Baseline Curve Components as a Function of Sunlight							
Maximum abs. value of field over sunlight		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	513	523	521	519	541	542
	Y	433	506	494	547	641	973
	Z	509	703	447	613	444	677
Thermal part of W	X	21.7600	30.1286	17.3609	37.3076	30.4462	21.8838
	Y	48.2632	80.3153	42.7782	82.3436	65.1164	50.6703
	Z	62.8011	90.4889	45.3199	96.0522	77.0389	56.3418
Impulse part of W	X	7.24919	7.73917	91.4109	51.5608	3.30452	19.1444
	Y	10.1501	12.2217	144.159	83.1206	5.16590	28.2642
	Z	13.7825	13.6595	147.872	84.6142	6.25975	30.7337
Continual -twist part of W	X	17	4	10	17	14	5
	Y	27	7	16	29	25	6
	Z	30	20	27	35	31	15

For Days 2000-116 and 2000-149, the impulse twist is the strongest component among the three twists in the baseline curve. For Day 2000-149, the thermal twist is close behind. For the remaining days, the thermal twist is strongest.

The measurements (in nT) of **average** absolute value of magnetic field in the baseline curve and in its component twists appear in Table 23.

TABLE 23. Average Contributions of Baseline Curve Components as a Function of Sunlight							
Average abs. value of field over sunlight		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	141.543	144.394	146.038	142.480	138.339	146.486
	Y	88.2904	109.094	88.3712	97.5812	94.5259	96.4692
	Z	82.1530	83.2034	80.8719	93.1343	83.1404	81.6874
Thermal part of W	X	7.94714	11.6677	6.59117	13.1009	10.4781	7.90736
	Y	14.0603	24.0007	12.7251	25.9760	21.0526	15.6334
	Z	17.2713	26.7113	15.4678	30.7038	24.6443	18.6557
Impulse part of W	X	0.04482	0.02125	0.38505	0.15807	0.01495	0.05918
	Y	0.10699	0.44610	1.46565	3.23128	0.07911	0.44293
	Z	0.16075	0.29085	2.94734	0.73210	0.09070	0.58623
Continual -twist part of W	X	7.44086	1.61177	3.86903	7.26641	5.73103	1.58320
	Y	14.3131	2.32320	7.17997	14.0604	11.2852	2.44307
	Z	13.9682	10.4054	14.6066	18.4449	15.7481	7.94300

For all six days, the thermal twist is the strongest component among the three twists in the baseline curve. Like in field-over-time, the impulse twist in field-over-sunlight is more prevalent among the maximum field intensities than among the average intensities.

According to the coefficient values, the predominant twist in the baseline curve for Day 2000-116 is the impulse twist. For the remaining days, the thermal twist is strongest, with the impulse twist close behind for Day 2000-149. These findings strongly resemble the pattern of prevalent twists for the maximum absolute value of the field in nT.

4.9.1.6 Fourier Transform of Field Versus Time Frequency

Now that W is decomposed well in none of the above domains, we resort to the Fourier transform (FT) of the field versus the frequency domain corresponding to time. Several more IDL programs perform this decomposition.

The purpose of the FT plots is to uncover patterns that the non-FT plots can not reveal. These patterns include similarities or differences between the baseline curve and each of the three twists (continual, thermal, and impulse). In this way, one can conclude something like this: 40 percent of the baseline curve is composed of a continual twist with angles (0.4, 0.1, -0.5) degrees, a 3.4-degree thermal twist, and a 0.15-degree impulse twist. 60 percent of the baseline curve is residual (artifacts, noise, etc). Moreover, since the magnetic-field curve is roughly orbit-periodic over time, its FT is theoretically a simple composite of delta functions, from which conclusions can be easily drawn.

The FT of a given function x(t) is defined in [*Proakis and Salehi*, 1994], Page 72, as:

$$X(f) = \int_{-\infty}^{\infty} x(t) e^{-j2\pi f t} dt, \quad \textbf{(43)}$$

where j = the complex number with real part zero and imaginary part 1,
f = the frequency variable, and
X(f) = the FT of x(t).

To illustrate the ability of the FT to reveal similarities between two functions, the graphs of the following functions are shown in Figure 32 for t between 0 and 2π:

$f_0(t) = 1$
$f_1(t) = \cos(t)$
$f_2(t) = \cos(2t)$
$x(t) = 0.5+\cos(t)+\cos(2t)$, and
$y(t) = 0.5+\cos(t)-\cos(2t)$

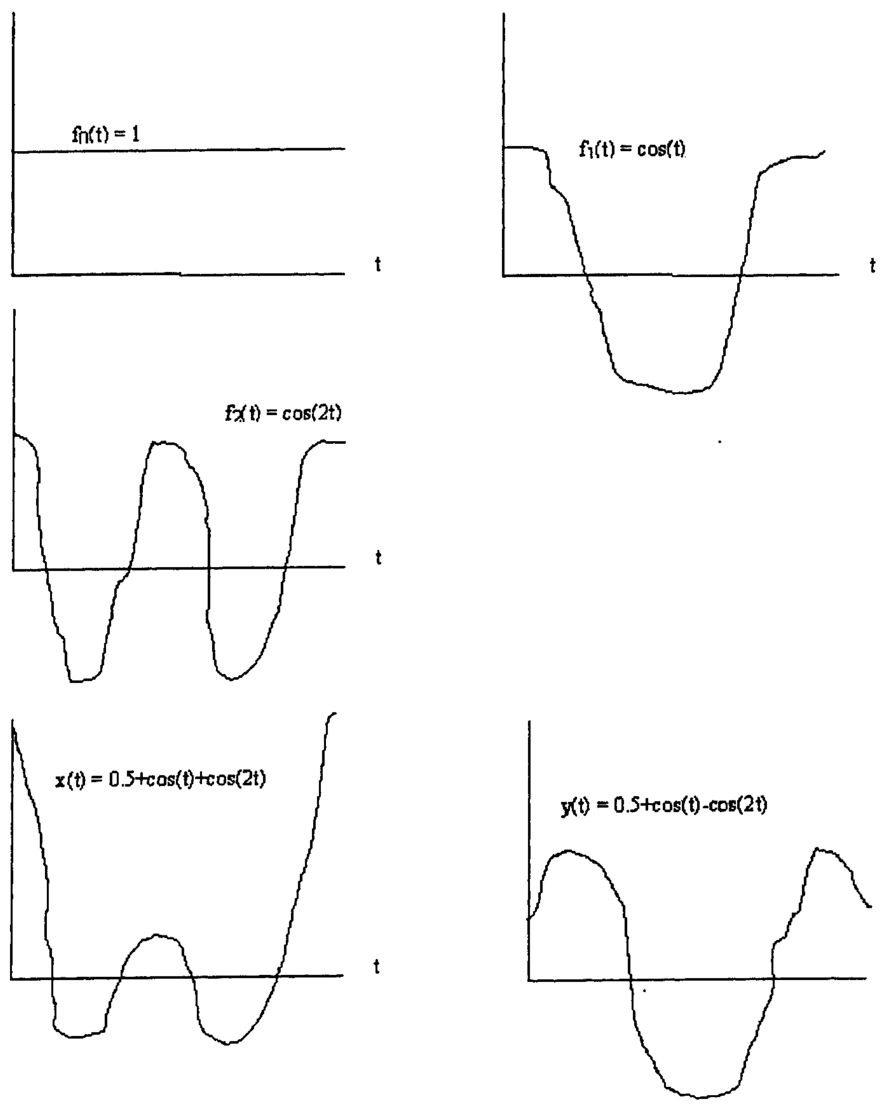


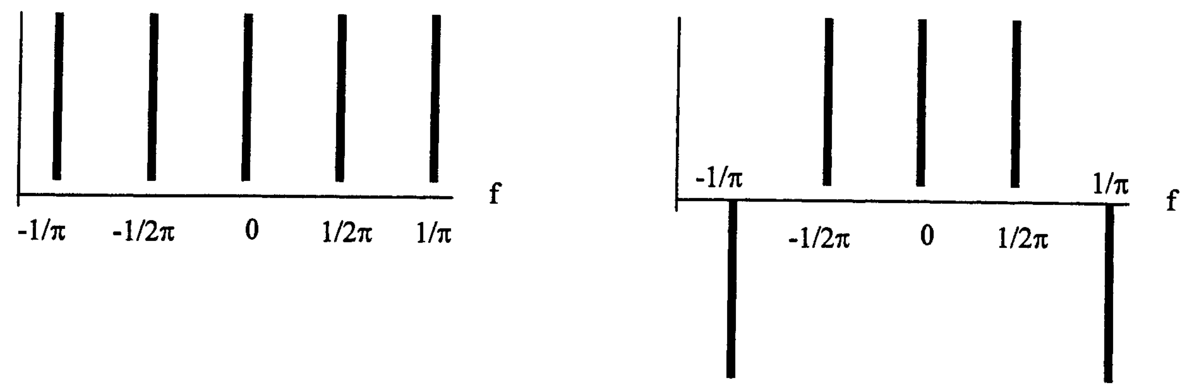
Figure 32. Usefulness of the Fourier Transform (I).

It is not at all apparent that the difference between x(t) and y(t) is 2*cos(2t). This effect is even more confusing when the functions cos(nt) are added together for more values of n. However,

from their respective Fourier transforms X(f) and Y(f) in Figure 33, this difference becomes clear.

X(f) = 0.5*
[δ(f + 1/π) + δ(f + 1/2π) + δ(f) +
δ(f - 1/2π) + δ(f - 1/π)]

Y(f) = 0.5*
[-δ(f + 1/π) + δ(f + 1/2π) + δ(f) +
δ(f - 1/2π) - δ(f - 1/π)]



where for any value f_0, $\delta(f\text{-}f_0)$ is the delta ("impulse") function that is infinite at $f = f_0$ and zero for all other values of f. In these graphs, f_0 is set to -1/π, -1/2π, 0, 1/2π, and 1/π.

Figure 33. Usefulness of the Fourier Transform (II).

Now we compare two functions b(t) and h(t) for the baseline and heat (thermal) curves, respectively, expressing them in the form:

$$b(t) = \sum_{n \in S} s_n e^{-j2\pi nt} + \sum_{n \in D} b_n e^{-j2\pi nt} \tag{44}$$

$$h(t) = \sum_{n \in S} s_n e^{-j2\pi nt} + \sum_{n \in D} h_n e^{-j2\pi nt} \tag{45}$$

where:
S (for "Same") is the set that contains each value of "n" whose coefficient s_n is the approximately the same (up to a 20% difference) for b(t) and h(t), and
D (for "Different") is the set with each "n" whose coefficients b_n for b(t) and h_n for h(t) are quite different.

Since the same phenomena repeat themselves each time the satellite orbits the Earth, b(t) and h(t) are themselves orbit-periodic. Thus, in many cases, we can assume that S is not much smaller than D. Now suppose that S is larger than D. Then the graphs of their FTs B(f) and H(f) resemble the left-hand and right-hand diagrams in Figure 34.

Please note that B(f) and H(f) are each a sum of delta functions $\delta(f-f_0)$ for thousands of values of f_0, and the discrete FT was used so that $\delta(f-f_0)$ is finite for $f = f_0$. Hence, these plots, unlike the delta-function plots drawn above, resemble regular functions.

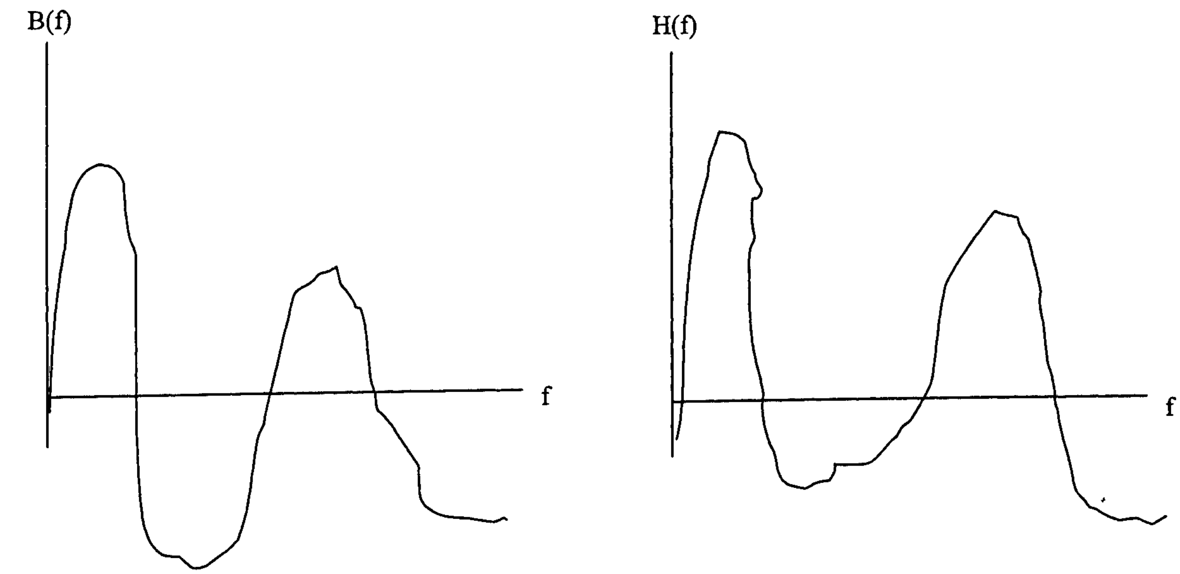


Figure 34. Usefulness of the Fourier Transform (III).

Here, one can clearly see that B(f) and H(f) are quite similar! Furthermore, since the FT is reversible, the original functions b(t) and h(t) are just as similar. However, the plots of the original functions b(t) and h(t) hide their similarities, as shown below:

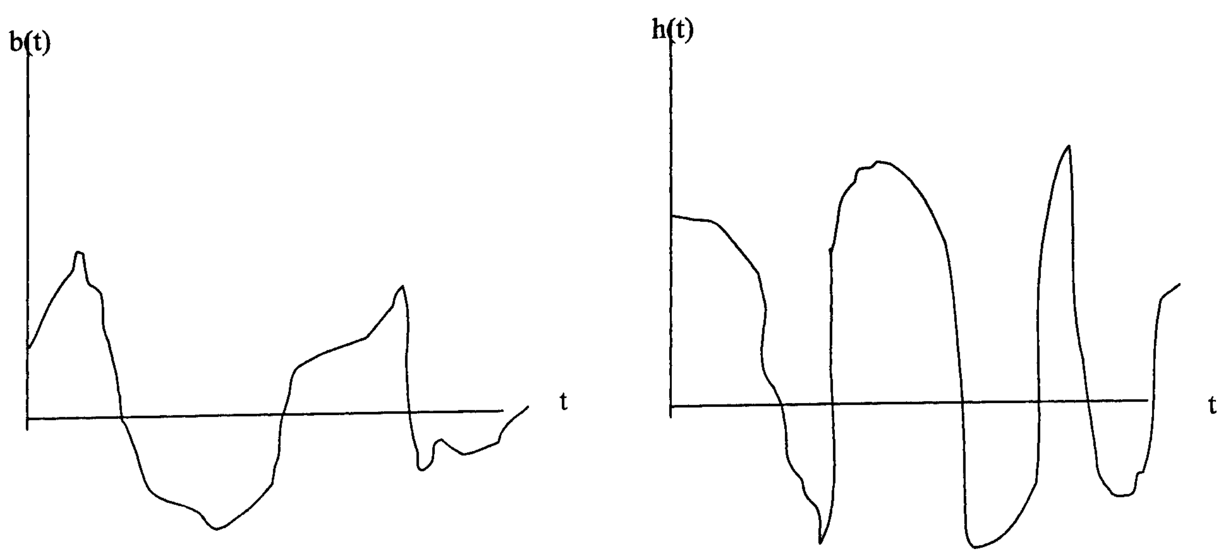


Figure 35. Usefulness of the Fourier Transform (IV).

The above discussion shows that the FT is often needed to find out whether two given periodic functions are similar.

The IDL programs that decompose W over the FT of field utilize IDL-language translations of the FORTRAN routines FOUR1 and REALFT in *Press, et al.* [1986], Pages 394 and 400, respectively. Together, these routines compute the Fast Fourier Transform (FFT) of a given function expressed as pairs of data points (t_i, $f(t_i)$) where $1 \le i \le 2^P$ and P is an integer. The FFT utilizes a numerical version of the above equation (see [*Press, et al.*, 1986], Page 389), and requires equally spaced t_i's. The times listed in the MFR file are about 1 second apart. Those seconds (t_i) skipped in the MFR file are filled in with their corresponding interpolated values $f(t_i)$ of magnetic-field strength.

Tables 24 and 25 below list the solutions and residual of the field-versus-FT plots, using the results of the FFT described above. Two tables are required: one for the real coefficients of the FT, and another for its imaginary coefficients.

TABLE 24. Real FFT-Derived Coefficients of Baseline Curve Components as a Function of Time

Time FT (real coefs)	Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
c_T	0.024941	-0.000765	-0.008324	-0.017983	-0.014665	-0.005465
c_I	-0.057860	-0.043390	-0.003359	0.039913	0.002163	-0.019795
A	-0.000017	0.000044	-0.000003	-0.000020	0.000007	0.000047
B	-0.112628	-0.044195	-0.010934	-0.033720	-0.004875	0.031291
C	-0.066608	-0.012889	-0.033304	0.004479	0.044570	0.026787
$\|R\|_2$	37015.7	37180.9	40462.4	42895.7	38697.7	40666.5
$\|W\|_2$	38307.8	37528.1	41026.4	44195.4	39198.0	40787.6
$\|R\|_2/\|W\|_2$	0.966270	0.990747	0.986252	0.970591	0.987238	0.997032

TABLE 25. Imaginary FFT-Derived Coefficients of Baseline Curve Components as a Function of Time

Time FT (img coefs)	Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
c_T	0.008351	0.001117	-0.004396	-0.005962	-0.011717	-0.008683
c_I	0.011366	0.019722	-0.025112	-0.002723	0.013365	0.004079
A	-0.000036	0.000145	0.000038	-0.000032	0.000052	0.000012
B	-0.088334	-0.058866	-0.004476	-0.048176	-0.007527	0.044058
C	-0.058951	-0.032724	-0.059089	-0.029560	0.034862	0.057468
$\|R\|_2$	34728.6	26021.9	41571.2	47140.9	40528.7	44489.5
$\|W\|_2$	35683.3	27124.1	42584.0	48355.0	41624.0	45039.3
$\|R\|_2/\|W\|_2$	0.973245	0.959365	0.976216	0.974893	0.973686	0.987793

The above field-frequency solutions do not properly decompose W.

The measurements (in nT) of **maximum** absolute value of magnetic field in the baseline curve and in its component twists appear in the Tables 26 and 27 below. Table 26 corresponds to the real part of the FFT, and the Table 27 to the imaginary part.

TABLE 26. Real FFT-Derived Maximum Contributions of Baseline Curve Components as a Function of Time

Maximum abs. value of field over time FT, real		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	513	523	521	519	541	542
	Y	433	506	494	547	641	973
	Z	509	703	447	613	444	677
Thermal part of W	X	40.5042	1.11690	12.7357	29.1684	24.4172	8.64563
	Y	89.8375	2.97738	31.3815	64.3791	52.2221	20.0183
	Z	116.898	3.35453	33.2461	75.0970	61.7836	22.2589
Impulse part of W	X	134.177	101.359	7.60813	95.0728	4.66559	46.4985
	Y	187.871	160.066	11.9983	153.266	7.29364	68.6491
	Z	255.105	178.897	12.3074	156.020	8.83802	74.6469
Continual -twist part of W	X	41	11	17	8	22	15
	Y	52	10	26	4	35	21
	Z	87	35	9	27	4	25

For Days 2000-050, 2000-083, 2000-149, and 2000-215, the impulse twist is the strongest component among the three twists in the baseline curve. For the remaining days the thermal twist is strongest.

TABLE 27. Imaginary FFT-Derived Maximum Contributions of Baseline Curve Components as a Function of Time

Maximum abs. value of field over time FT, img		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	513	523	521	519	541	542
	Y	433	506	494	547	641	973
	Z	509	703	447	613	444	677
Thermal part of W	X	13.5620	1.63082	6.72588	9.67036	19.5088	13.7365
	Y	30.0803	4.34736	16.5729	21.3440	41.7242	31.8058
	Z	39.1411	4.89805	17.5576	24.8973	49.3637	35.3659
Impulse part of W	X	26.3578	46.0706	56.8787	6.48619	28.8283	9.58157
	Y	36.9054	72.7545	89.7001	10.4563	45.0668	14.1460
	Z	50.1127	81.3138	92.0104	10.6442	54.6094	15.3819
Continual -twist part of W	X	35	20	28	18	17	30
	Y	46	26	46	23	27	45
	Z	69	46	4	38	6	34

For Days 2000-050, 2000-149, and 2000-215, the continual twist is the strongest component among the three twists in the baseline curve. For the remaining days, the impulse twist is strongest. Hence, the pattern of prevailing twists for the imaginary part of the FFT is different from that of the real part.

The measurements (in nT) of **average** absolute value of magnetic field in the baseline curve and in its component twists appear in Tables 28 and 29. As before, the Table 28 refers to the real part of the FFT, and the Table 29 to the imaginary part.

TABLE 28. Real FFT-Derived Average Contributions of Baseline Curve Components as a Function of Time

Average abs. value of field over time FT, real		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	141.543	144.394	146.038	142.480	138.339	146.486
	Y	88.2904	109.094	88.3712	97.5812	94.5259	96.4692
	Z	82.1530	83.2034	80.8719	93.1343	83.1404	81.6874
Thermal part of W	X	14.7929	0.43253	4.83519	10.2427	8.40324	3.12396
	Y	26.1720	0.88973	9.33498	20.3090	16.8838	6.17628
	Z	32.1490	0.99022	11.3469	24.0054	19.7643	7.37030
Impulse part of W	X	0.82956	0.27836	0.03205	0.29147	0.02110	0.14374
	Y	1.98022	5.84256	0.12199	5.95815	0.11169	1.07582
	Z	2.97535	3.80918	0.24531	1.34991	0.12805	1.42386
Continual -twist part of W	X	16.5232	4.41548	7.51908	2.56069	9.89056	6.25280
	Y	29.6923	5.75684	14.9396	2.01239	20.0676	12.0512
	Z	50.1870	19.7345	4.90356	15.1534	2.19402	14.0772

For Days 2000-050, 2000-083, 2000-116, and 2000-215, the continual twist is the strongest component among the three twists in the baseline curve. For the other two days the thermal twist is strongest. Thus, the impulse twist in field-over-frequency is more prevalent among the maximum field intensities than among the average intensities.

According to the coefficient values, the predominant twist in the baseline curve for Days 2000-050, 2000-083, 2000-149, and 2000-215 is the impulse twist. For the remaining two days, the thermal twist is strongest. These findings are identical to the pattern of prevalent twists for the maximum absolute values of the field in nT.

TABLE 29. Imaginary FFT-Derived Average Contributions of Baseline Curve Components as a Function of Time							
Average abs. value of field over time FT, img		Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Baseline (= W)	X	141.543	144.394	146.038	142.480	138.339	146.486
	Y	88.2904	109.094	88.3712	97.5812	94.5259	96.4692
	Z	82.1530	83.2034	80.8719	93.1343	83.1404	81.6874
Thermal part of W	X	4.95310	0.63156	2.55352	3.39583	6.71399	4.96347
	Y	8.76318	1.29913	4.92991	6.73314	13.4898	9.81311
	Z	10.7645	1.44585	5.99245	7.95862	15.7912	11.7102
Impulse part of W	X	0.16296	0.12652	0.23959	0.01988	0.13040	0.02962
	Y	0.38899	2.65561	0.91197	0.40649	0.69014	0.22168
	Z	0.58448	1.73138	1.83393	0.09210	0.79122	0.29340
Continual -twist part of W	X	14.3320	8.39783	13.3097	7.21435	7.75216	13.0379
	Y	26.2784	14.6090	26.5031	13.2828	15.6976	25.8561
	Z	39.3607	26.2842	2.00672	21.6497	3.38667	19.8218

For Day 2000-182, the thermal twist is the strongest component among the three twists in the baseline curve. For the remaining days the continual twist is strongest. Hence, the impulse twist in field-over-frequency is more prevalent among the maximum field intensities than among the average intensities, and the pattern of prevailing twists for the imaginary part of the FFT is different from that of the real part.

According to the coefficient values, the predominant twist in the baseline curve for Days 2000-050 and 2000-149 is Angle B of the continual twist. For Days 2000-083, 2000-116, and 2000-182 the impulse twist is strongest. For Day 2000-215, Angle C of the continual twist prevails. These findings are identical to the pattern of prevalent twists for the maximum absolute values of the field in nT.

4.9.1.7 Overall Composition of W According to the Above Least-Squares Method

The above least-squares method does not properly decompose W. Hence, we try to summarize the values above in Sections 4.9.1.2 through 4.9.1.6, in the hopes of discovering a pattern.

Table 30 summarizes the main components of the twists of W according to the angular degrees represented by the coefficients (c_T, c_I, A, B, and C) tabulated above, for each type of plot and each sample day. These components are selected among the following five twist types: Thermal, Impulse, Continual twist angle A, Continual twist angle B, and Continual twist angle C. The last

three are symbolized in the table below as "A," "B," and "C," respectively. The plot types appear in the left-hand column of the table.

The calculations of this table recognize the fact that since the thermal and impulse twists T_5 and I_5 are taken at 5 degrees, their true effect is 5 times their coefficients c_T and c_I.

TABLE 30. Summary of Primary Twist Components by Angle

Angular degrees	Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Time	B	Impulse	Impulse	Thermal	Thermal	Thermal
Time FT: real	Impulse	Impulse	Thermal	Impulse	Thermal	Impulse
Time FT: imaginary	B	Impulse	Impulse	B	Impulse	C
Altitude	B	Impulse	C	B	A	Thermal
Latitude	B	Impulse	Impulse	Thermal	Thermal	Thermal
Sunlight	Thermal	Thermal	Impulse	Thermal	Thermal	Thermal

Although the main composition of W depends on the plot type, this dependence is not random. The thermal twist is more prevalent when it is late spring and summer in the Northern Hemisphere than during winter there. The solutions for non-FT time and latitude produce the same results in Table 30.

According to Table 30, the thermal and impulse twists are quite prevalent in the baseline curve, where the thermal twist is a bit more prevalent than the impulse twist. The above results lead one to think that the twists in W consist of Thermal, Impulse, B, C, and A in order of decreasing amounts. However, visual inspection of the graphs shows that the continual and thermal twists are more present in W than is the impulse twist; see Sections 4.9.2.5 and 0.

Table 30 expresses the contribution of each twist to the baseline curve in coefficients and thus in degrees. However, Tables 31 and 32 express it in terms of nT. Table 31 records the dominant twist type with respect to maximum nT over each data day, and Table 32 with respect to average nT. The information in these tables is derived from Sections 4.9.1.3 through 4.9.1.7 above.

TABLE 31. Summary of Primary Twist Components by Maximum Field Strength						
Maximum nT	Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Time	Impulse, Continual	Impulse	Impulse	Thermal	Thermal	Thermal
Time FT: real	Impulse	Impulse	Thermal	Impulse	Thermal	Impulse
Time FT: imaginary	Continual	Impulse	Impulse	Continual	Impulse	Continual
Altitude	Impulse	Impulse	Continual	Continual	Thermal	Thermal
Latitude	Continual	Impulse	Impulse	Thermal	Thermal	Thermal
Sunlight	Thermal	Thermal	Impulse	Impulse	Thermal	Thermal

The results in Table 31or Maximum nT are identical to those of angular degree, except Time for Day 2000-050, Altitude for Days 2000-050 and 2000-182, and Sunlight for Day 2000-149. The order for Maximum nT is like that for angular degree, except that the thermal twist is a bit less, not more, prevalent than the impulse twist.

FIGURE 32. Summary of Primary Twist Components by Average Field Strength						
Average nT	Day 2000-050	Day 2000-083	Day 2000-116	Day 2000-149	Day 2000-182	Day 2000-215
Time	Continual	Thermal	Thermal	Thermal	Thermal	Thermal
Time FT: real	Continual	Continual	Continual	Thermal	Thermal	Continual
Time FT: imaginary	Continual	Continual	Continual	Continual	Thermal	Continual
Altitude	Continual	Thermal	Continual	Continual	Thermal	Thermal
Latitude	Continual	Thermal	Thermal	Thermal	Thermal	Thermal
Sunlight	Thermal	Thermal	Thermal	Thermal	Thermal	Thermal

The results in Table 32 for average nT are quite different from those for angular degree and maximum nT. In most cases, the thermal twist is strongest. In the remaining cases, the continual twist prevails. The impulse twist is absent, since it is theoretically zero except for its spikes.

The thermal twist prevails for all sunlight plots, and for all plots of Day 2000-182. The prevalence patterns of the time and latitude rows in the Table 32 are identical for all days. The patterns of the real and imaginary parts of the FT of time are the same except for Day 2000-149.

4.9.2 Inspection of the Graphs

Visual comparison of the baseline plots with the graphs of the twist types shows the conclusions of the analysis in Section 4.9.1 to be misleading, except for the results pertaining to average field strength. In contrast to the analytic method, many FT graphs (see Section 4.9.2.5) bear similarities between the baseline curve and the twists.

This Section is outlined as follows:

Sections 4.9.2.1 through 4.9.2.4 report that the non-FT plots of field versus time reveal a few similarities. For example, the X-axis time plots of the baseline curves resemble the thermal twist. However, these similarities are nowhere as numerous as in the FT graphs, which are treated in Section 4.9.2.5. Sections 4.9.2.6 and 4.9.2.7 relate that many of these similarities and other plot effects are due to noise and natural activity, rather than to the baseline curve and the thermal, impulse, and continual twists.

4.9.2.1 Plots of Field Versus Time

The X-axis curves of the baseline plots (Figure 36) resemble those of the thermal twist (Figure 37). In addition, each baseline plot has spikes that look similar to some of the spikes in its corresponding impulse plot. However, the positions of the spikes of the baseline curve are generally different from those of the impulse curve. In APPENDIX H, Figures 59 (baseline) and 61 (impulse) demonstrate these facts for Day 2000-050.

The field-versus-time plots contain no other discernible effects from which to determine the composition of oscillation types in the baseline curve.

Figures 36, 37, and 38 also appear in APPENDIX H as Figures 59, 60, and 61.

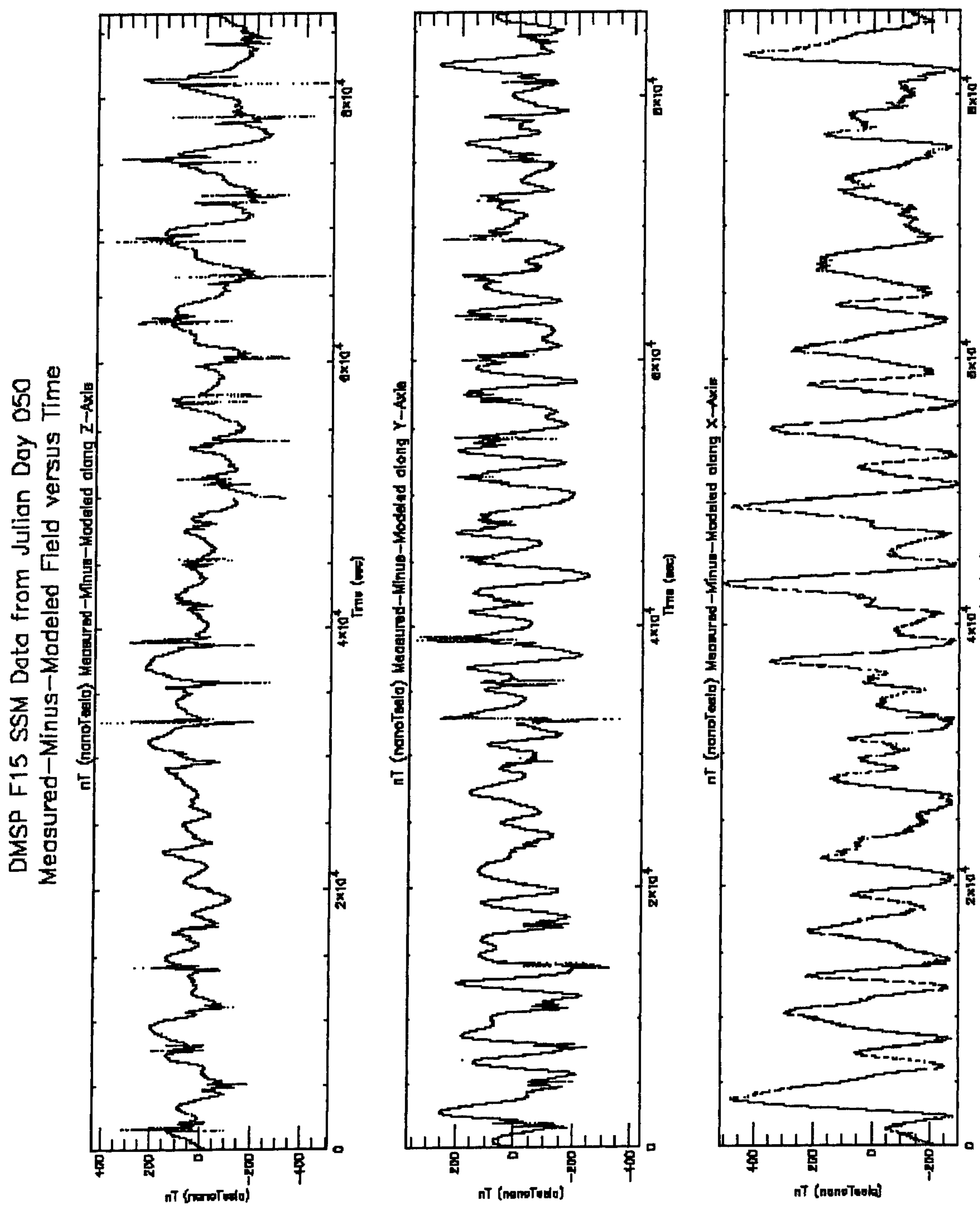


Figure 36. Baseline Curve, Field Versus Time, All 24 Hours of Day 050-2000 (Figure 59 in APPENDIX H).

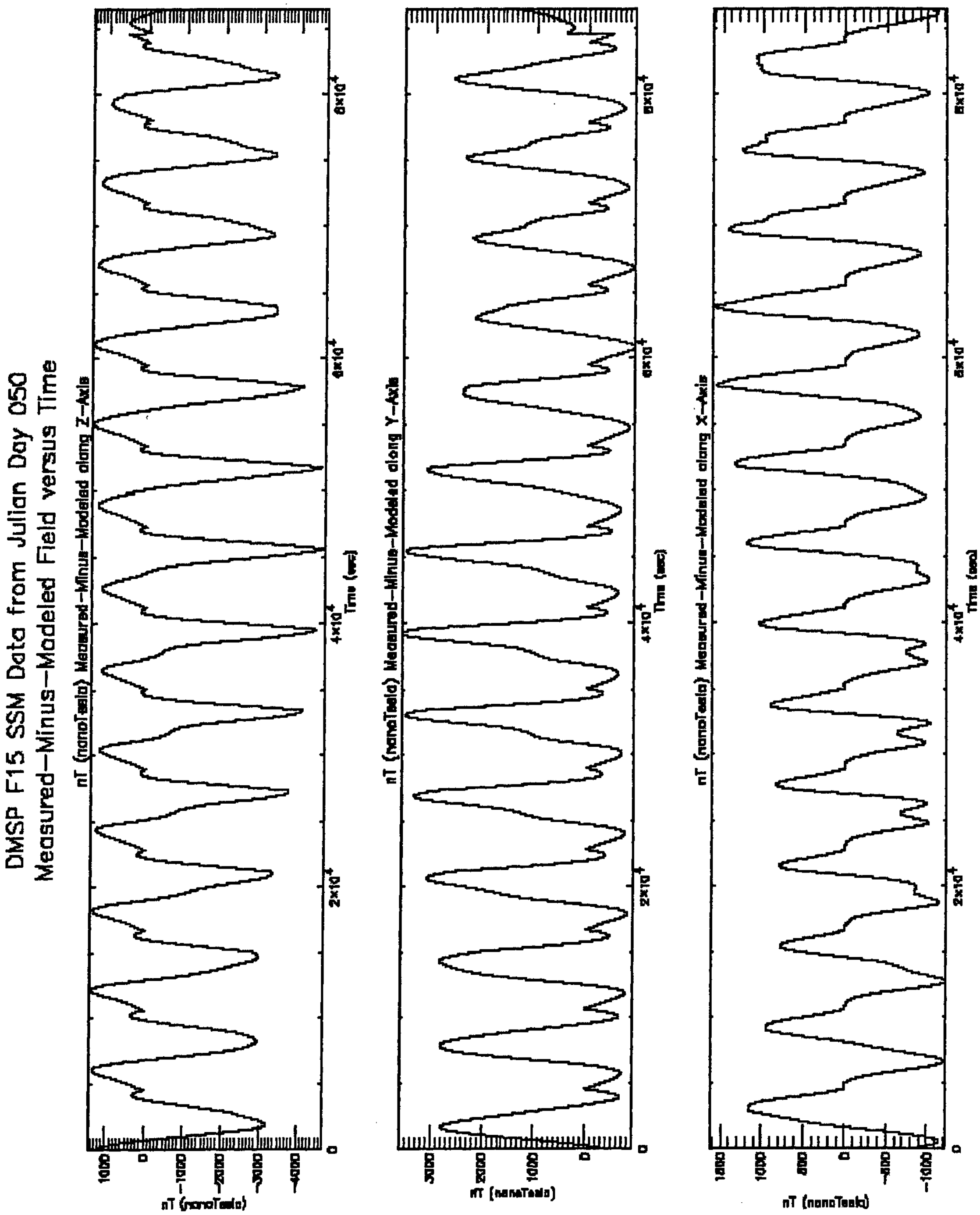


Figure 37. Thermal Twist, Field Versus Time, All 24 Hours of Day 050-2000 (Figure 60 in APPENDIX H).

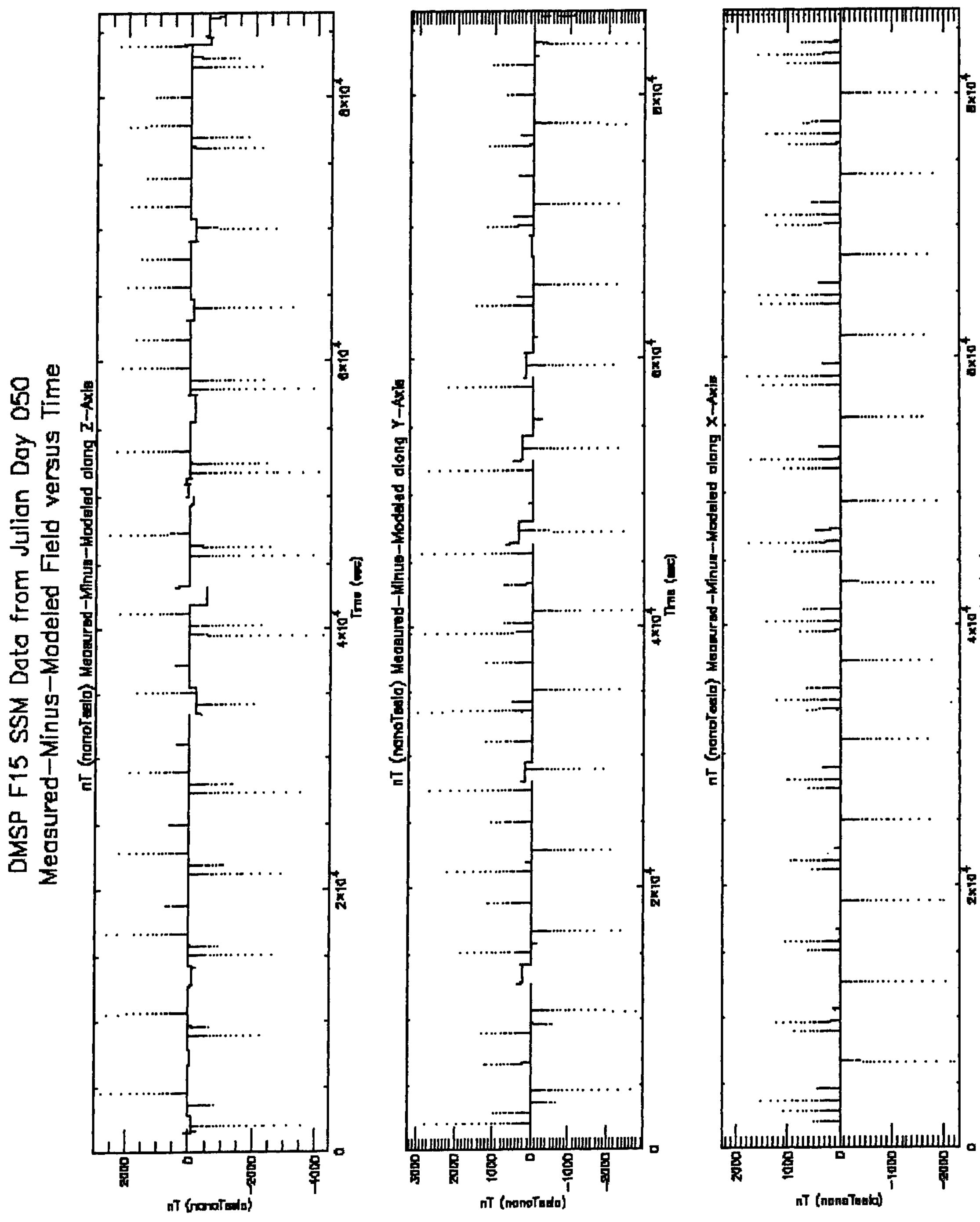


Figure 38. Impulse Twist, Field Versus Time, All 24 Hours of Day 050-2000 (Figure 61 in APPENDIX H).

4.9.2.2 Plots of Field Versus Altitude

The field-versus-altitude plots reveal no similarities between the baseline curve and the twist curves.

4.9.2.3 Plots of Field Versus Latitude

The field-versus-latitude plots reveal no similarities between the baseline curve and the twist curves.

4.9.2.4 Plots of Field Versus Sunlight

In the field-versus-sunlight plots, the only items that show near the terminator crossings, on either end of the plot, are those that are defined in Subroutines APSM_THERMAL and APSM_IMPULSE as the thermal and impulse twists, respectively.

Each thermal-twist plot narrows on the left-hand end, where sunlight = 0, and widens on the right-hand end where sunlight = 1. This finding merely reflects that the thermal twist was defined in Subroutine APSM_THERMAL to be proportional to the amount of sunlight.

Each impulse-twist plot bears a spike at either end, and two spikes straddling the middle of the plot (where sunlight = 0.5). The end spikes correspond to the impulse twists applied in Subroutine APSM_IMPULSE whenever the satellite crosses the day-night terminator. The middle spikes correspond to the equatorial impulses defined in APSM_IMPULSE. In fact, a sample of six latitudes was taken where the sunlight level of the satellite corresponds to a middle spike on the plots. This sample suggests that the satellite crosses the equator when its sunlight level passes through the second middle-spike level on its way from sunlight=0.0 to sunlight=1.0 or vice versa (but in many cases the equator is crossed at the first middle-spike level). For example, when the satellite passes through sunlight=0.65 on its way up from 0.0 to 1.0, its latitude is within 10 degrees of the equator.

The field-versus-sunlight plots reveal no similarities between the baseline curve and the twist curves.

4.9.2.5 Plots of Fourier Transform of Field Versus the Frequency Domains

In contrast to the non-FT plots, many FT graphs bear similarities between the baseline curve and the twists.

For example, in the real and imaginary FT-time curves, the baseline ($F15_{meas}$ - $F15_{mod}$) has approximately the same shape as the thermal curves in the X-axis. This similarity is weaker in the Y-axis and the Z-axis. The clusters of data points in the centers of the baseline plots of axes Y and Z are larger than in the X-axis plots. The X-axis clusters are in turn bigger than the clusters on the thermal plots for all three axes.

The FT-time baseline curve, whether real or imaginary, slightly resembles the impulse curve in the X-axis for Day 2000-116 and in the Y-axis for Days 2000-083 and 2000-149.

It is useful to plot the continual twists whose angles are the solutions A, B, and C of each run of the plot programs. These solutions are taken from the previous tables. For example, the continual-twist plot for the imaginary part of FT of time, Day 2000-083, uses the solutions A = 0.000145 degrees, B = -0.058866 degrees, C = -0.032724 degrees in the "Time FT (img coefs)" table.

The time-FFT graphs of the continual twist resemble those of the thermal twist. Thus, in the time-frequency domain, the similarities between the baseline and continual-twist curves are identical to the above resemblances between the baseline and thermal-twist curves.

Each FT-time plot of the baseline and thermal curves contains a small cluster of data points in the middle (where the frequency is close to zero), and a horizontal line stretching across the rest of the page. Hence these plots do not disclose much information. Therefore, another set of plots has been produced, setting the limits of the vertical axis to 10,000 and -10,000. In these plots, the real FT-time curves still exhibit similarities, but not as many as do the uncropped curves. The baseline ($F15_{meas}$ - $F15_{mod}$) has approximately the same shape as the thermal curves in the X-axis and Y-axis. The imaginary FT-time baseline and thermal curves are similar in the X-axis for Day 215, but not in all other combinations of axis and day. Otherwise, the resemblance is weak or nonexistent in the X-axis for Day 2000-083, in the Y-axis for Days 2000-116 and 2000-182, and in the Z-axis for all days. For examples using Day 2000-050 for the X-axis, see below in Figure 39 (APPENDIX H, Figure 62 (baseline)) and Figure 40 (APPENDIX H, Figure 63 (thermal)).

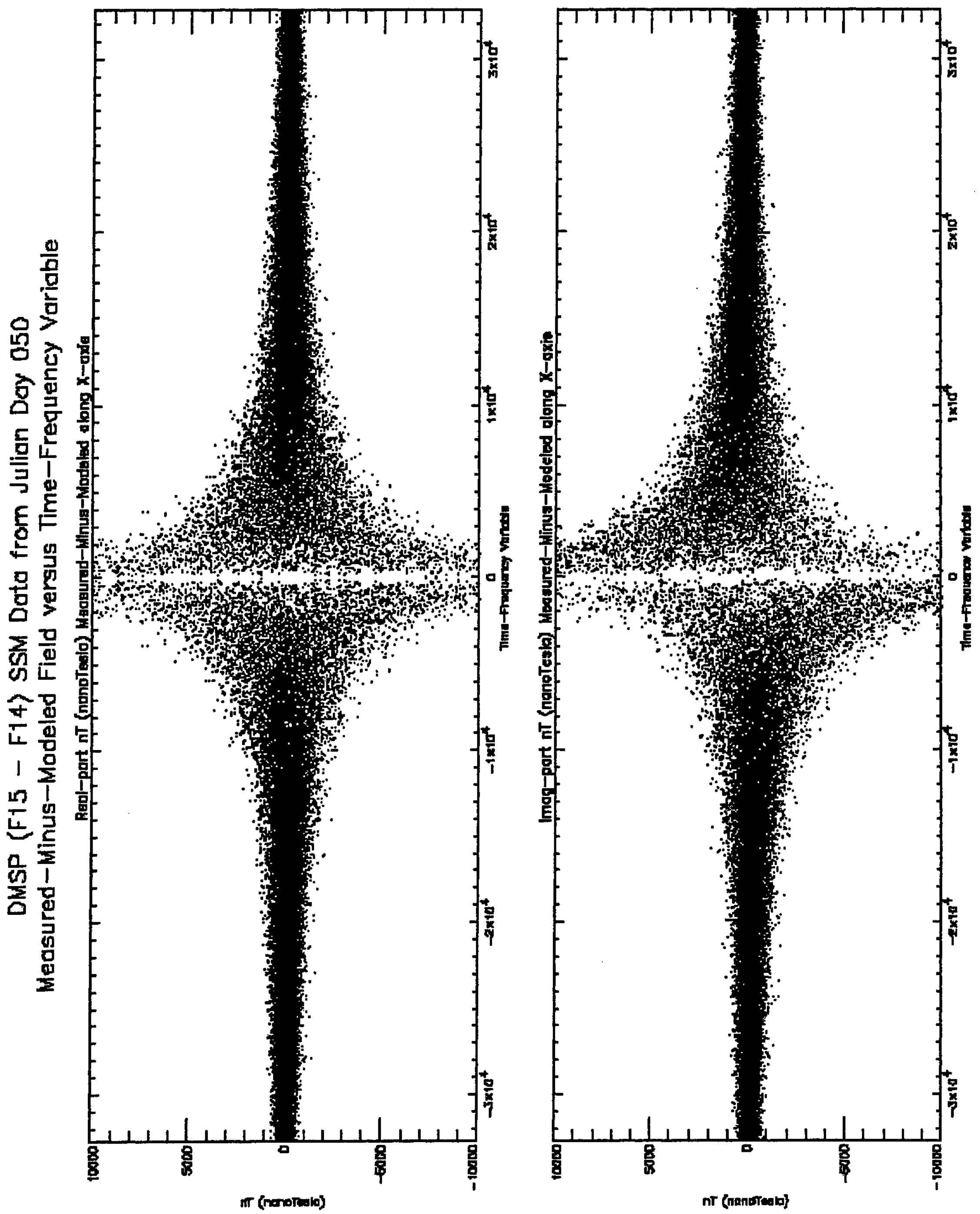


Figure 39. Baseline Curve, FT of Field Versus Time, X-axis, All 24 Hours of Day 050-2000, With Only Field Values Between -10000 and 10000 (Figure 62 in APPENDIX H).

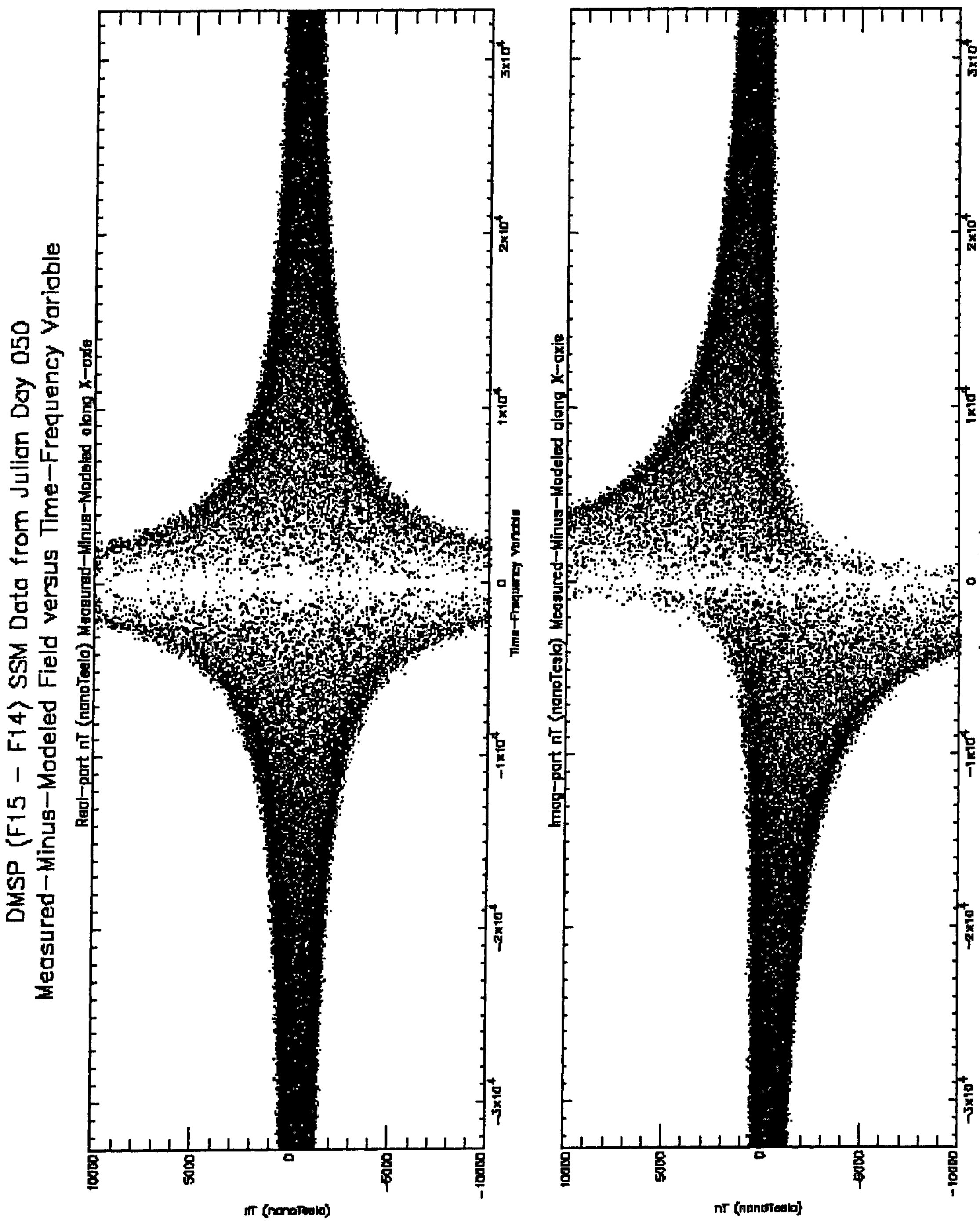


Figure 40. Thermal Twist, FT of Field Versus Time, X-Axis, All 24 Hours of Day 050-2000, With Only Field Values Between -10000 and 10000 (Figure 63 in APPENDIX H).

The baseline curve differs substantially from the impulse curve.

The time-FFT graphs of the continual twist resemble those of the baseline curve, except that the data points are much more scattered in the baseline plots than in the continual twist. In other words, the baseline and continual-twist plots differ mainly by a scale factor. However, in most plots of the imaginary part of the FFT, there is a difference between the baseline and the continual twist in the directions from which the horizontal arms of the plot connect to its center.

In summary, according to visual inspection of the plots, the continual twist is the main component of the baseline curve, with the thermal twist following closely and the impulse twist far behind. This finding contradicts the result of Section 4.9.1 above that indicates that the thermal twist prevails, followed closely by the impulse twist, and the continual twist far behind.

4.9.2.6 Misidentification of Noise

However, not all of the above similarities reflect true boom twists. Many of these similarities are due instead to noise or natural phenomena. Section 4.9.2.6 deals with noise, where Section 4.9.2.7 addresses natural phenomena.

Given a twist type:

Thermal, Impulse, or Continual

a domain over which the field is plotted:

time, altitude, latitude, sunlight, real part of time FFT, or imaginary part of time FFT

and the recorded quantity of field strength in nT:

maximum absolute value, or average absolute value

the amount of noise in such a combination depends on several factors, of which we consider three. The most important is the magnitude (in nT) of this field relative to the magnitude of the baseline field. The second factor measures the consistency of the magnitude over the three axes (whether or not for each sample day, field strength increases as one goes up the axes from X to Y and then Z). The least important factor is the consistency of the magnitude over the sample days (whether or not field strength is highest on Days 2000-149 and 2000-182 or follows an obvious pattern).

For example, if one has solved for a thermal artifact, but the magnitude of the artifact is very small, then one may have only found a partial fit to some of the noise. If it is large, then it is more likely to be "real." If the artifact tends to gain strength as one goes up the axes, then it is more likely to be real. However, if the size of the artifact varies wildly, then one may have just solved for a lot of different noises on different days.

The following classifies the amount of noise for all combinations of twist type, domain, and recorded quantity. Each such combination is rated Low noise, Medium noise, or High noise. This rating is based on the above three factors (size relative to baseline, monotonicity over the axes, and consistent pattern of strongest days) in decreasing order of importance. "Real" represents the real part of FFT time, and "imaginary" stands for its imaginary part. Each line represents one or more combinations and uses the following format:

twist type - domain(s) - maximum, average, or both

Low noise
Thermal - time, latitude, and sunlight - both maximum and average
Thermal - real - average
Impulse - latitude and real - maximum
Continual - time, latitude, and imaginary - average

Medium noise
Thermal - altitude and imaginary - both maximum and average
Thermal - real - maximum
Impulse - time, altitude, sunlight, and imaginary - maximum
Continual - all domains - maximum
Continual - altitude, sunlight, and real - average

High noise
Impulse - all domains - average

The average field strength correlates well to the plots. Thus, it more reliably indicates baseline decomposition than does the maximum strength, which corresponds to the least-squares solution coefficients of angular degree. The entries above that correspond to the average field strength are isolated below. Again, "real" represents the real part of FFT time, and "imaginary" stands for its imaginary part. Each row has the notation:

twist type - domain(s)

Low noise
Thermal - time, latitude, sunlight, and real
Continual - time, latitude, and imaginary

Medium noise
Thermal - altitude and imaginary
Continual - altitude, sunlight, and real

High noise
Impulse - all domains

Thus, we conclude that the thermal-twist component of the baseline curve contains slightly less noise than does the continual-twist part. The impulse-twist component is far behind and contains much noise.

4.9.2.7 Misidentification of Natural Phenomena

The recorded twist components of the baseline curve may stem not only from noise, but also from natural phenomena, especially in auroral latitudes. Two major types of such phenomena are discussed here:

--Actual long-period curves in the measured-minus-modeled field due to activity, storms, equatorial magnetism, ephemeris error, and most of all error in the model-field curve. Artifacts that are found should exceed the level of error involved. Consistency is also important: if there is a long-period (e.g., most of an orbit) effect from the boom, then this effect should appear in the data for multiple days. Otherwise, these effects are probably due to natural activity.

-- Auroral regions: if the correspondence of impulse artifacts to the data at the terminators is improved when the terminator coincides with the area of auroral activity, then that improved correspondence is likely due to misidentifying natural spikes representative of aurora activity as impulse artifacts caused by the terminator.

Section 0 below discusses the various artifacts that regularly occur in the plots, and mentions whether each artifact is likely to be part of the baseline curve or the twists, as opposed to natural activity. Section 0 focuses on spikes in the impulse twist that appear in auroral regions. Section 0 summarizes Section 0 by suggesting that all artifacts except for altitude-plot spots and kinks are natural phenomena.

4.9.2.7.1 Artifacts

Each field-versus-altitude plot of the baseline curve contains dark spots at around 850 km and at the highest altitude for this plot. For Day 2000-116 the first dark spot occurs near 862 km instead of 850 km, and a change of shading takes place near 851 km. For Day 2000-149, the first dark spot is near 860 km and the shading change near 852 km. Hence, this effect is fairly consistent across the data days, and is probably due to the twist components of the baseline.

In addition, the field-versus-altitude plot of the continual twist for Day 2000-083 contains vertical blotches of data points near 850 and 852 km. The plot for Day 2000-116 shows a large vertical line at around 867 km. For Day 2000-149 this line appears at 869 km. For Day 2000-215 the line occurs near 852 km. These lines are less noticeable on the X-axis. This set of plots also contains less prominent vertical lines not listed above. In summary, the lines are somewhat consistent over the data days, but small and anomalous enough to be regarded as natural activity.

The altitude plots of the thermal twist for all days except Day 2000-116 contain kinks in the vicinity of 850 km. Hence, the kinks are consistent, and thus, probably part of the thermal twist itself.

The field-versus-latitude plots of the baseline curve contain spots of active data near the left-hand and right-hand ends of the plots. Although these spots are consistent, their positions represent high latitudes, the auroral regions. Hence, they may be due to auroras.

The latitude plots of thermal twist for all days contain at least one long straight line that resembles a bowstring. This line appears isolated from the rest of the plotted data points, with its right-hand end at 80 degrees North. Its left-hand end varies from 10 to 40 degrees South depending on the individual day. Days 2000-050 and 2000-083 have bowstrings in the Y-axis and Z-axis plots. Days 2000-116, 2000-149, and 2000-215 contain bowstrings only on the Y-

axis. For Day 2000-182 the bowstring appears only on the Z-axis. Although the bowstring is fairly consistent, it seems anomalous and thereby due to a natural effect.

Each field-versus-sunlight plot of the baseline curve contains spots of active data near 0.2 and 0.9 on the horizontal axis. Although these spots are consistent, their positions represent regions near where they cross the day-night terminator. These crossings take place at high latitudes. Hence, the active spots may be due to auroras.

A natural consequence of the Fourier Transform plots is that most of the field strength is confined to frequencies near zero. In addition, the close-up FT plots of the baseline curve and the continual twist, where the vertical axis is chopped to [-10000, 10000], show a vertical gap for frequencies very close to zero. This gap may stem from construction of the FT algorithm. In summary, the effects seen on the FT plots come from the FT algorithm, not from the boom twists themselves.

4.9.2.7.2 Impulse Spikes in Auroral Regions

The impulse twist lies in the auroral zone. A small sample has been taken of the most prominent impulse spikes in the baseline curves of field versus time. The vast majority of spikes in this sample occur in high latitudes. This observation suggests that the spikes are due to auroras, not to impulse twists of the F15 boom.

In addition, the plots have been re-drawn with the impulse at a random location (at 45 degrees north) instead of at the equator and day-night terminator. The fit between the baseline and impulse plots is not better with the impulses in their original locations than when the impulse is applied at 45 degrees north. This finding is another indication that the impulse twist is due to a natural phenomenon.

4.9.2.7.3 Which Artifacts are Actual Twists?

Of all artifacts listed above, the only ones likely to stem from the data itself, rather than from natural activity, are dark spots and thermal kinks on the altitude plots.

4.9.3 Summary of Decomposition Analysis

This Section combines the most important results of Sections 4.9.1 and 4.9.2. Section 4.9.3.1 demonstrates the lack of important findings of the least-squares method of Section 4.9.1, whereas Section 4.9.3.2 concentrates on the more successful comparison of plots in Section 4.9.2.

4.9.3.1 Least-Squares Results

This Section portrays the ineffectiveness of the least-squares method. Section 4.9.3.1.1 explains why little of the baseline curve is decomposed, and suggests a remedy to this problem. Section 4.9.3.1.2 summarizes the overall composition of the baseline curves as found above in Section 4.9.1.7, and records a test that decides whether the spikes found in the curves are from real impulses.

4.9.3.1.1 Decomposition of a Small Amount of the Baseline Curve

The analytical results do not accurately decompose the baseline curves because their least-squares method adds the errors for every point, so that a single point with a large residual error is enough to make the error large, ruining the accuracy. In other words, even if two curves look alike when graphed, many of their points are different, enough to bring $|R|_2$ close to $|W|_2$. In addition, the least-squares method used in the analysis may contain errors, especially in its approximation of the continual twist. Noise may be another source of error. Thus, the analytical results do not detect the similarities found on the graphs.

4.9.3.1.2 Overall Makeup of the Baseline Curve

The results of Section 4.9.1.7 lead one to think that the twists in W consist of Thermal, Impulse, B, C, and A in order of decreasing amounts. However, visual inspection of the graphs shows that the continual twist; which consists of A, B, and C; and the thermal twist prevail over the impulse twist; see Sections 4.9.2.5 and 4.9.3.2.1. The impulse twist is the least present of the three twist types in the baseline curve, since it is theoretically zero except for spikes over selected small intervals of time.

That the impulse twist seems to be a dominant component according to Section 4.9.1.7 is no surprise. It is easier to fit a function consisting of various "random" curves with a series of impulse functions. This is even truer when there are impulse-like spikes in the high latitudes. In fact, a small sample has been taken of the most prominent spikes in the baseline curves of field versus time. The vast majority of spikes in this sample occur in high latitudes. This observation suggests that the spikes are due to auroras, not to impulse twists of the F15 boom.

As a control to the impulse experiment, the plots have been re-drawn with the impulse at a random location (at 45 degrees north) instead of at the equator and day-night terminator. The fit between the baseline and impulse plots is not better with the impulses in their original locations than when the impulse is applied at 45 degrees north. This finding is another indication that the baseline curve does not have a strong impulse-twist component.

The proportions of contributions of the three twists to the baseline curve in terms of Maximum nT are identical to those of angular degree, except Time for Day 2000-050, Altitude for Days 2000-050 and 2000-182, and Sunlight for Day 2000-149. The order of prevalence of these contributions for Maximum nT is like those for angular degree, except that in the former, the thermal twist is a bit less, not more, prevalent than the impulse twist.

The proportions of contributions in terms of Average nT are quite different from those for angular degree and Maximum nT. In most cases, the thermal twist is strongest. In the remaining cases, the continual twist prevails. The impulse twist is absent, since it is theoretically zero except for its spikes.

4.9.3.2 Visual Inspection

This Section summarizes the many conclusions drawn from visually comparing the baseline plots with those of the twist types, especially for the Fourier transforms.

4.9.3.2.1 Results

Among the non-FT baseline curves, the X-axis curves of field versus time resemble those of the thermal twist. Each field-versus-time plot has spikes that look similar to some of the spikes in its corresponding impulse plot. However, the impulse plot has different spike positions from those of the baseline plot.

The remaining non-FT baseline curves do not resemble the plots of their corresponding twist types.

However, the FT graphs reveal more information than do the non-FT graphs and the analytical results. Two groups of GIF images have been used to determine the decomposition of the baseline curve. In one group, the extremes of the vertical axis are set to [TMIN, TMAX]. Here TMIN is the minimum field in nT in a given plot of field versus domain, and TMAX is the maximum field. In the other group, the vertical axis is limited to the interval [-10000, 10000], thereby magnifying the plot origin (frequency = 0, field = 0) and its vicinity where most of the data points are concentrated.

Of the three axes, the X-axis and Y-axis contain the greatest amount of similarity between the baseline curve and the three twists. The Z-axis has the fewest similarities.

Overall, the most similar twist to the baseline is the continual thermal twist, followed closely by the thermal continual twist, leading to the conclusion that the boom effect is mostly due to continual and thermal oscillation. This finding sharply contradicts the conclusion found by the least-squares method, which claims that the impulse twist is the best fit (see end of Section 4.9.1.7).

4.9.3.2.2 Confusion of Boom Twists with Noise and Natural Sources

However, many of the above similarities come from noise and natural phenomena.

Measurement of the noise is based on several factors. The primary factor is the field intensity of each twist component of the baseline curve relative to that of the baseline itself. The second is whether or not for all sample days the twist magnitude increases from the X-axis to the Y-axis and then the Z-axis. The least important is consistency in pattern of magnitude change over the sample days.

In general, the thermal-twist component of the baseline curve contains slightly less noise than does the continual-twist part. The impulse-twist component is far behind and consists of much noise.

As with noise, attribution of artifacts in the baseline and twist curves to natural phenomena is based on magnitude of these effects and their consistency over the data days. Several types of artifacts found in the output plots, that are consistent over the sample data days, are treated below. Some of them may be part of the twist itself, whereas others are probably due to natural activity.

The field-versus-altitude plots of the baseline curve and non-impulse twists contain dark spots, changes in shading, kinks, and vertical lines. Most of them can be found between 850 and 852 km. or at the highest altitude on the plot. The vertical lines appear to be added natural phenomena, whereas the other effects may come from the twists themselves.

The field-versus-latitude and field-versus-sunlight plots of the baseline curve contain spots of active data near both ends of the plot. These ends reflect high latitudes, and thus auroral regions. Hence, they may be due to auroras. Similarly, a small sample of impulse spikes shows that the spikes in the impulse twist are due to auroras.

On the FT plots, the artifacts are probably due to mathematical properties of the FT algorithm, not to the twists themselves.

To conclude, the only artifacts likely to stem from the data itself are dark spots and thermal-twist kinks on the altitude plots.

4.10 Summary Of Boom-Artifact Experiment

This Section draws conclusions from all of the results in the entire boom-effect experiment reported in this paper. These results appear in Sections 4.6.3 and 4.8.3.

Sections 4.10.1and 4.10.2 attempt to answer the questions posed at the beginning of this paper. Section 4.10.1 refers to Sections 4.6.3 that indicates whether or not the results of *Cook, et al.* [1997] hold for the real data sets.

Section 4.10.2 summarizes what factors, if present, would exert the greatest influence on the output measured-minus-modeled amounts of magnetic-field intensity. Afterwards, Section 4.10.3 lists observations from the factor-comparison study of Section 4.8 that are not covered in Section 4.10.2. Sections 4.10.2 and 5.10.3 refer to Section 4.8.3.

Section 4.10.4 summarizes the most important results of the baseline-curve decomposition in Section 4.9, as well as the attribution of most curve artifacts to noise and natural phenomena.

Section 4.10.5 is a short epilogue that addresses the challenge of removing errors from the field measurements.

4.10.1 The Results of the Preliminary Simulation

One objective of Section 4.6 is to confirm the results of *Cook, et al.* [1997] for a different set of data from that used in *Cook, et al.* [1997]. It turns out that, as stated in Section 4.6.3, the study of Section 4.10.2 confirms most results of *Cook, et al.* [1997]. However, unlike in *Cook, et al.* [1997], the baseline plots (of unmodified measured-minus-modeled data) for many sample days

of data contain oscillations. In addition, stronger oscillations in the X-axis exist on all baseline plots than those seen in *Cook, et al.* [1997]. Both changes may be due to the fact that the prepfiles of Section 4.6.3 represent different days and satellite numbers from those in *Cook, et al.* [1997].

4.10.2 Order of Importance of Twist Types and Other Factors

This and the following Section refer to Section 4.8.3.

The question is what factors, if present, would exert the greatest influence on the output measured-minus-modeled amounts of magnetic-field intensity. The answer is that the most influential factor is the heat angle, since it greatly influences curves X, Y, and Z. Next come the continual-twist angles, since each such angle affects two of these three curves. Of these angles, B is first since it drives somewhat more data points out of the plotting bounds than does C. In turn, C causes much more out-of-bounds data than does A.

The next factor in the order is the day number. Like the above factors, the day number influences oscillations that affected the whole curve, but these oscillations are weaker than the above twist-angle effects.

The impulse parameters do not affect the curve as a whole, but cause spikes to grow out of the baseline curve. Among these factors, the impulse angle is first since multiplying it by N multiplies the spike heights also by N. The damping angle is next, for it influences the spike heights, but not to the degree of multiplication by N. The impulse duration merely reduces the number of spikes when the impulses last a very long time.

The Universal time is ranked last since it does not at all affect the curves in these experiments with induced artifacts.

From the above order of factors, it can be advised that the top priority is to remove the effects of thermal and continual boom oscillation from the data, whereas damped-impulse oscillation is not such a problem. Section 4.9.2.5 demonstrates that for six months of real data, the "detectable" boom oscillation is indeed mostly classified as thermal and continual.

4.10.3 Other Observations

Other facts can be culled from results in Section 4.8.3.

The most noticeable effect is that the X-axis field differences tend to be smaller than those of the Y-axis and Z-axis. In addition, many effects in the Z-axis such as spikes and thermal oscillations are mirrored in the Y-axis. Thus, boom oscillations tend to disturb the directions Y and Z of the magnetic field equally, and more strongly than they disturb the X-direction.

Moreover, the twist types are additive and multiplicative, and thus linear, so that the effects on the magnetic-field differences are proportional to the angle by which the boom is twisted. Thus, we can search for, and potentially remove, each twist type separately without knowing its magnitude in advance.

The twist types are additive, since combining two or more twist types adds their effects on the plot, following the rules of constructive and destructive interference of waves, an effect that is most interesting because of its implications for detection and removal. However, this effect of adding the twist types is noticeable only when the waves interfere constructively. Moreover, when all three twist types are combined, the impulse twist is the most conspicuous of the three types because of its distinct form; the continual and thermal twists are hard to tell apart.

The twist types are multiplicative in the following manner. Multiplying a continual-twist angle (A, B, or C) by N does not influence its corresponding curve, but multiplies the amplitude of each of the other two curves by a factor equal to, or approximately, N. For example, multiplying A by N leaves the X-curve alone, but multiplies the amplitudes of Y and Z by N.

On the other hand, multiplying the maximum heat angle or the maximum impulse angle by N multiplies the amplitudes of X, Y, and Z by N. This fact followed since each of these two twist algorithms rotates the measured-field vector by the same angle in all three dimensions.

However, the factors other than the maximum twist angles have less than a linear effect on the field differences. Multiplying the damping time by N raises the impulse height, but by a factor less than N. Moreover, the impulse height actually *decreases* with damping time as the latter quantity grows near 1200 seconds. As the damping time increases, the spikes thicken and split apart at the bottom. Increasing the time of application of impulses does little except to reduce the number of spikes when the impulses last a very long time.

4.10.4 Decomposing the Baseline into Twist Types

This Section refers to the tables of Section 4.9.1.7 and the plot comparisons of Sections 4.9.2.1 and 4.9.2.5.

The baseline curve has been decomposed using two methods: least-squares solution and visual inspection of plots. The former method decomposes only a small part of the baseline. Its results indicate that the thermal and impulse twist types have the greatest rotation angles and maximum field strengths, whereas the thermal and continual twists have the largest average field strengths. However, only the results for average field strength are compatible with the plot inspection, which shows that the baseline curve is most similar to the thermal and continual twists.

The pattern of prevalence of twist types for the maximum absolute value of field is nearly identical to that of the rotation angle. In particular, the thermal twist has the largest contribution of rotation angle in the baseline curve, with the impulse twist close behind. On the other hand, the impulse twist has the largest maximum absolute value of nT because of its spikes, followed

closely by the thermal twist. The continual twist is far behind in both rotation angle and maximum absolute value.

A reason for this correlation is that the angle parameter for the thermal and impulse twists determines the maximum rotation of the boom and thus the maximum absolute value of field. This relationship is not true for the continual twist, which anyway plays only a smaller role than do the other twists.

The prevalence pattern of twist types for the average absolute value is similar to that of the plots that graph Fourier transform of field versus frequency. For the average absolute value, the thermal twist is strongest, followed closely by the continual twist. For the plots, the continual twist is slightly ahead of the thermal twist. For both average absolute value and plots, the impulse twist lags far behind, since most of its field strength occurs in the spikes, which involve only a small fraction of the data points.

Among the non-FT plots, the only similarities between the baseline curve and the twist types appear in the field-versus-time plots. In the field-versus-time X-axis plots, the baseline curves resemble the thermal twists. For all axes, the field-versus-time baseline curves have spikes that look similar to a few spikes in the impulse plots.

4.10.4.1 Confusion of Boom Twists with Noise and Natural Sources

However, many of the above similarities come from noise and natural phenomena.

The thermal-twist component of the baseline curve contains slightly less noise than does the continual-twist part. The impulse-twist component is far behind and consists of much noise.

As with noise, attribution of artifacts in the baseline and twist curves to natural phenomena is based on magnitude of these effects and their consistency over the data days.

Several types of artifacts, which are consistent over the sample data days, appear in the output plots. Of all artifacts listed above in Section 0 and 0, the only ones shown to stem from the data itself, rather than from natural activity, are dark spots and kinks on the field-versus-altitude plots. A dark spot is an intensely shaded (black) area, and a kink is a sharp bend in a curve. Such kinks may be due to a thermal twist in the boom.

The artifacts on the FT plots are due to properties of the FT algorithm. The remaining artifacts appear anomalous or lie in auroral latitudes.

4.10.5 Epilogue

The model presented in this report is but a simple implementation of the system. The varieties of errors present different challenges to the filtering process, and in combination may conflict with the removal of each other. Nevertheless, if the precision of the data allowed it, the errors

discussed must be removed from the SSM data in order for it to be more accurate for better use in forecasting or analytical models.

5. SUMMARY

This section provides a brief summary of the salient observations of this data study. For more detailed discussions of results, see individual sections.

1. An early calibration for the SSM aboard DMSP F15 was determined. It is recommended for use from launch through day 2000-097. The calibration is:

$$\begin{bmatrix} Bx' \\ By' \\ Bz' \end{bmatrix} = \begin{bmatrix} 0.99528597 & 0.00917236 & 0.00593256 \\ -0.00033594 & 0.99729121 & -0.00337577 \\ 0.00108272 & -0.00326025 & 0.99352186 \end{bmatrix} \begin{bmatrix} Bx \\ By \\ Bz \end{bmatrix} + \begin{bmatrix} -20.65 \\ -13.17 \\ -1.77 \end{bmatrix} \tag{46}$$

2. A late calibration for the SSM aboard DMSP F15 was determined. It is recommended for use from day 2000-098 until superceded. The calibration is:

$$\begin{bmatrix} Bx' \\ By' \\ Bz' \end{bmatrix} = \begin{bmatrix} 0.99517418 & 0.00863488 & 0.00699771 \\ -0.00055869 & 0.99756404 & -0.00291095 \\ 0.00022768 & -0.00329771 & 0.99405258 \end{bmatrix} \begin{bmatrix} Bx \\ By \\ Bz \end{bmatrix} + \begin{bmatrix} -16.65 \\ -10.14 \\ -0.68 \end{bmatrix} \tag{47}$$

3. When defined as the range of differences between two calibrations on two different adjacent days' data, the accuracy of the calibration process is about +/-8, +/-12, -7 to 1, 3 to 14nT, in X, Y, Z, and magnitude, respectively.

4. When defined as the difference between the calibrated measured and modeled fields, the average precision of the calibration is about 25, 44, 25, 64nT, in X, Y, Z, and magnitude, respectively. If the difference is expressed as one sinusoidal error in each dimension, the amplitudes of the sinusoids are in the range of 33-47, 60-82, 22-82, and 82-140nT in X, Y, Z, and magnitude, respectively.

5. The calibrated measured-minus-modeled field data contains one to three orbital-period sinusoids in each axis, independent of magnetic activity and exclusive of unusual phenomena. While they vary in amplitude versus each other for a given data set, most are contained in the following ranges:
   -80 to 130 nT for the X-axis
   -80 to 150 nT for the Y-axis
   -80 to 80 nT for the Z-axis

6. Various error sources such as a satellite altitude or other ephemeris error, or a time-phase error between position (model) and data frame (measurement) could account for errors of the magnitude and type observed, but the error has not been conclusively attributed to any one

source. The form of the calibration is incapable of removing non-linear and date/time dependent errors.

7. In the Z-axis of the measured-minus-modeled field, a sinusoid occasionally displays much greater amplitudes for a given day of data than is typical for that dimension. This Z-wave was observed primarily early in the year 2000, and can exhibit amplitudes of up 300nT.

8. A sawtooth wave was observed in the X-dimension on all days. The typical height of the vertical discontinuity was 20-30nT, with a period of 70-100seconds.

9. The effects of potential boom-induced errors are additive and multiplicative, so that the effects on the magnetic-field differences are proportional to the angle by which the boom is twisted. Thus, each twist type can be searched for, and potentially removed, separately without knowing its magnitude in advance.

10. No gross boom-induced artifacts were observed except for the Z-wave, X-sawtooth, and the remaining sinusoids in the data. It is not impossible to confirm or deny the presence of artifacts having an effect smaller than the level of precision of the calibrated data.

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APPENDIX A. EARLY CALIBRATION DATA QUALITY RESULTS

The columns of data below have the following format from left to right:

1. Day of year 2000.
2. Day average difference from zero of measured-minus-modeled field for all X (down) components in nT.
3. Day average difference from zero of measured-minus-modeled field for all Y (velocity) components in nT.
4. Day average difference from zero of measured-minus-modeled field for all Z (orbit normal) components in nT.
5. Day average magnitude of differences from zero of measured-minus-modeled field for all components in nT.
6. Day average difference from zero of measured-minus-modeled field for non-auroral (automated clipping) X (down) components in nT.
7. Day average difference from zero of measured-minus-modeled field for non-auroral (automated clipping) Y (velocity) components in nT.
8. Day average difference from zero of measured-minus-modeled field for non-auroral (automated clipping) Z (orbit normal) components in nT.
9. Day average magnitude of differences from zero of measured-minus-modeled field for non-auroral (automated clipping) components in nT.
10. Angle between a field vector of [18000 18000 18000]nT and that same vector with the correction ORTHO calibration matrix applied, in degrees. Correction ORTHO matrix is the result of applying the early calibration to that day's data and then calculating an ORTHO and OFFSET for that day's non-auroral (automated clipping) calibrated data. It is a measure of the difference between the early calibration and a calibration based on just that day's data.
11. Angle between a field vector of [18000 18000 18000]nT and that same vector with the correction ORTHO and OFFSET calibration matrices applied, in degrees. Correction matrices are the result of applying the early calibration to that day's non-auroral (automated clipping) data and then calculating an ORTHO and OFFSET for that day's calibrated data. It is a measure of the difference between the early calibration and a calibration based on just that day's data.
12. Difference in magnitude between a field vector of [18000 18000 18000]nT and that same vector with the correction ORTHO and OFFSET calibration matrices applied, in nT. Correction matrices are the result of applying the early calibration to that day's non-auroral (automated clipping) data and then calculating an ORTHO and OFFSET for that day's calibrated data. It is a measure of the difference between the early calibration and a calibration based on just that day's data.
13. Daily Ap.

005	36.83	63.96	175.78	205.43	24.42	57.00	184.24	204.36	0.1414	0.1633	96.83	19
006	33.86	54.87	41.26	88.74	22.98	45.79	25.58	65.19	0.0885	0.0943	18.76	19
007	32.34	48.73	29.62	75.68	21.70	42.77	20.69	58.52	0.0527	0.0645	20.82	10
008	32.09	51.16	156.48	179.33	22.58	45.74	168.91	184.43	0.1789	0.2169	86.18	5
009	34.14	45.94	60.70	93.08	26.34	41.92	62.47	87.34	0.0153	0.0331	6.51	3
010	33.03	56.06	151.01	176.07	25.12	47.87	162.00	178.11	0.0760	0.0995	16.48	6
011	34.79	67.00	49.86	106.40	26.00	54.00	28.90	76.91	0.0844	0.0932	34.52	24
012	40.42	58.71	57.53	105.37	30.18	52.80	49.62	89.04	0.0529	0.0421	6.32	10
013	36.84	53.34	30.53	82.47	27.69	46.46	20.09	64.79	0.0763	0.0895	15.88	9
014	31.06	50.27	63.97	98.51	20.80	42.96	64.85	88.27	0.0386	0.0418	36.17	8
015	30.19	48.89	74.84	104.79	20.00	41.40	78.81	97.50	0.0447	0.0605	26.92	6
016	32.13	54.39	170.72	194.37	23.28	47.82	181.15	196.98	0.1093	0.1259	44.22	6
017	31.73	49.85	96.14	123.42	23.44	43.11	99.99	118.99	0.0258	0.0356	9.36	3
018	34.72	52.96	104.58	134.83	27.16	45.51	107.45	129.10	0.0463	0.0422	16.96	3
019	35.72	48.64	55.51	94.01	28.59	41.97	50.81	81.43	0.0382	0.0329	3.26	5
020	35.72	50.85	57.52	96.85	27.70	40.86	50.43	79.92	0.0501	0.0414	18.48	10
021	36.23	44.48	98.73	125.26	29.41	41.38	104.45	124.79	0.0370	0.0475	19.27	2
022	38.20	65.25	69.17	116.20	28.79	50.24	52.26	88.41	0.0336	0.0149	6.95	22
023	47.64	78.68	84.86	142.90	31.85	68.61	72.80	119.25	0.1052	0.0885	11.37	29
024	39.37	61.58	75.37	121.36	29.17	53.61	63.91	101.27	0.0774	0.0702	35.53	13
025	34.64	58.41	60.99	105.17	24.24	47.13	50.64	84.08	0.1013	0.1010	37.90	7
026	34.84	50.84	57.03	96.39	24.95	44.11	50.59	81.75	0.0488	0.0429	21.08	8
027	33.53	57.63	39.89	89.38	24.87	44.46	21.87	61.93	0.0192	0.0277	2.89	17
028	36.77	61.64	48.00	98.41	25.31	47.14	27.56	67.97	0.1081	0.1155	33.53	32
029	36.98	60.94	50.17	99.60	25.10	46.39	25.82	65.96	0.0579	0.0659	14.05	30
030	36.40	54.78	59.71	101.89	27.01	46.57	51.34	84.69	0.0553	0.0569	28.74	15
031	37.75	51.22	102.76	133.39	27.98	45.64	105.68	127.90	0.0426	0.0530	28.68	10
032	36.83	47.48	53.92	91.77	29.61	42.51	51.17	82.09	0.0280	0.0305	4.62	8
033	37.63	46.76	27.73	75.73	30.02	41.65	19.32	61.96	0.0658	0.0697	5.56	8
034	36.64	50.67	55.68	95.30	29.63	43.39	50.59	82.30	0.0477	0.0466	3.03	10
035	32.38	46.44	24.17	69.89	24.07	40.83	17.60	56.54	0.0478	0.0501	1.32	5
036	32.47	48.78	35.86	80.38	24.16	42.89	20.45	60.71	0.0362	0.0447	29.40	12
037	36.33	67.84	49.95	105.02	24.71	50.48	24.02	68.76	0.0795	0.0796	7.94	34
038	38.17	58.58	49.19	98.39	25.84	48.47	27.90	69.80	0.0820	0.0910	7.48	31
039	38.23	52.54	40.37	88.49	27.46	44.62	22.67	64.79	0.0696	0.0761	5.75	15
040	37.50	53.53	33.12	84.50	28.16	44.90	20.00	63.82	0.0817	0.0846	23.62	11
041	37.38	51.78	29.88	80.28	28.31	43.81	19.47	62.26	0.0524	0.0537	4.33	10
042	36.49	57.01	39.09	90.36	28.00	47.06	19.26	64.82	0.0803	0.0799	9.83	17
043	49.96	96.02	89.02	160.67	31.71	80.13	60.43	120.28	0.1545	0.1440	27.94	60
044	42.93	62.67	63.93	113.89	30.88	57.94	50.93	94.12	0.1014	0.0993	25.84	14
045	43.18	69.71	54.74	114.30	30.32	55.85	25.36	77.39	0.0828	0.0749	8.18	33
046	40.36	54.75	51.78	100.66	28.14	49.49	39.36	82.22	0.0263	0.0269	4.00	17
047	39.08	59.48	147.88	180.66	32.18	52.11	150.48	174.98	0.1214	0.1488	37.09	7
048	35.43	50.68	61.01	97.44	24.73	47.81	51.87	83.32	0.0543	0.0659	19.07	6
049	33.99	47.31	21.38	70.30	24.18	45.73	14.77	59.35	0.0127	0.0153	7.35	1
050	32.49	46.33	24.41	70.71	23.79	43.42	16.04	58.00	0.0063	0.0038	6.15	3
051	32.26	48.57	25.68	72.46	24.02	44.92	15.98	58.93	0.0110	0.0122	3.12	5
052	31.76	55.90	38.28	86.23	23.77	47.02	19.12	62.87	0.0280	0.0233	2.64	21
053	32.04	46.38	25.82	70.06	24.85	43.21	19.14	59.24	0.0600	0.0754	3.20	6
054	29.99	54.20	35.28	80.65	22.83	44.95	23.34	62.11	0.0327	0.0385	2.21	11
055	32.77	60.26	46.04	94.70	23.56	46.85	23.15	64.37	0.0577	0.0573	26.91	30
056	34.56	52.98	41.02	85.92	23.73	43.53	25.68	62.61	0.0365	0.0362	20.25	20
057	33.18	54.26	56.92	97.05	23.79	44.64	46.28	77.45	0.0358	0.0319	26.08	16
058	33.06	50.57	33.94	78.40	23.54	43.23	22.98	60.23	0.0194	0.0248	3.88	13
059	35.28	53.59	38.72	85.25	25.71	44.96	25.65	64.83	0.0349	0.0407	27.58	16
060	32.36	47.58	48.89	84.85	22.63	42.32	45.79	73.96	0.0197	0.0294	25.49	7
061	33.91	62.47	47.95	98.14	23.22	47.89	27.79	68.04	0.0531	0.0482	25.49	21
062	34.11	51.52	33.20	79.40	22.72	44.12	24.08	61.65	0.0448	0.0511	13.08	11
063	32.54	46.84	29.32	72.27	23.14	42.46	22.07	59.08	0.0361	0.0406	10.61	5
064	31.27	46.04	25.56	68.71	23.04	42.01	20.88	58.14	0.0321	0.0364	7.05	3
065	30.63	49.42	30.94	74.72	22.19	42.89	20.78	58.43	0.0259	0.0300	9.94	6
066	30.88	58.34	39.61	87.39	22.38	44.23	23.72	61.43	0.0369	0.0471	10.36	12
067	33.70	61.96	46.38	95.12	23.31	47.03	28.71	66.45	0.0652	0.0672	38.87	16
068	34.62	62.87	48.27	98.24	24.74	47.70	27.13	67.53	0.0406	0.0319	3.72	14
069	36.23	49.03	27.71	75.19	27.21	43.67	22.11	62.39	0.0656	0.0695	4.02	4
070	36.19	54.38	56.77	98.44	27.38	46.09	46.00	80.08	0.0446	0.0352	4.43	9
071	37.33	59.31	47.78	96.29	26.79	48.43	28.23	69.46	0.0611	0.0542	7.97	13
072	34.12	59.32	39.34	88.67	24.41	45.05	24.40	63.30	0.0455	0.0471	18.02	19
073	34.49	49.47	31.47	77.08	24.67	42.93	22.95	60.93	0.0358	0.0425	0.14	4
074	34.80	51.04	33.04	79.02	26.34	43.47	22.63	62.04	0.0367	0.0453	4.90	6

075	32.69	48.00	26.52	71.91	24.36	41.95	21.61	59.56	0.0504	0.0590	11.18	2
076	30.38	44.68	24.96	66.96	23.57	41.22	21.69	58.43	0.0497	0.0552	2.04	2
077	30.42	48.58	27.40	71.14	24.22	43.03	22.35	60.64	0.0502	0.0503	2.34	4
078	30.46	48.21	29.26	73.01	24.55	43.53	22.76	61.78	0.0558	0.0595	1.67	6
079	31.27	52.70	34.30	80.46	24.72	43.11	22.09	61.60	0.0358	0.0363	22.47	7
080	33.47	55.62	52.54	97.21	28.24	46.66	42.91	81.45	0.1010	0.1113	9.22	6
081	32.65	53.30	24.57	76.17	27.31	47.67	18.26	64.41	0.0747	0.0844	0.79	4
082	31.56	56.90	37.15	85.60	26.44	48.33	23.61	67.08	0.0798	0.0948	13.29	12
083	32.47	59.45	38.60	88.95	25.42	46.76	21.41	64.09	0.0537	0.0637	6.03	14
084	33.57	54.57	34.49	83.02	26.36	49.96	22.72	67.56	0.0480	0.0593	5.14	11
085	33.94	55.68	31.76	82.75	26.33	47.47	20.54	64.81	0.0607	0.0698	7.23	8
086	33.56	51.45	27.89	77.03	26.78	47.20	21.61	65.14	0.0852	0.0980	6.06	3
087	32.06	49.81	28.59	75.15	25.49	45.55	22.93	63.97	0.0124	0.0105	2.32	4
088	31.41	48.83	31.61	74.79	23.47	42.08	25.76	61.57	0.0313	0.0337	11.30	4
089	31.90	50.05	34.69	78.98	24.61	42.75	27.02	63.94	0.0222	0.0257	9.53	10
090	32.79	49.56	38.67	80.98	25.29	42.96	25.85	63.35	0.0097	0.0115	6.51	12
091	38.82	69.10	58.56	111.63	29.79	51.76	35.00	78.66	0.1262	0.1193	23.05	23
092	41.32	57.01	41.99	93.22	33.70	46.84	28.34	72.41	0.0794	0.0751	1.13	13
093	40.91	70.33	57.96	112.54	29.90	54.86	42.15	84.80	0.1065	0.1007	46.94	15
094	35.96	67.37	42.68	99.29	26.39	53.18	27.24	73.30	0.0646	0.0604	11.99	9
095	38.83	66.93	46.27	103.94	26.94	57.59	27.68	77.92	0.0359	0.0324	7.21	22
096	36.83	59.62	33.78	88.57	26.58	51.80	23.45	69.82	0.0449	0.0432	17.56	11
097	49.15	112.13	67.36	157.47	36.17	96.54	47.68	128.35	0.1605	0.1833	39.04	82
098	66.85	114.35	59.69	165.60	44.44	117.50	47.64	149.19	0.1398	0.1180	72.17	74
099	46.10	64.53	56.38	112.81	31.85	56.96	48.43	94.20	0.1163	0.1150	68.73	10
100	40.92	59.17	44.75	96.38	27.99	49.56	31.33	73.51	0.0783	0.0840	27.62	14
101	41.04	70.29	53.17	110.10	27.17	53.91	35.91	79.11	0.1023	0.1035	66.76	19
102	37.95	55.02	41.53	89.46	26.55	46.01	27.16	66.77	0.0616	0.0579	35.26	9
103	36.15	51.73	32.56	80.11	26.00	43.44	25.32	63.48	0.0381	0.0340	30.86	7
104	36.85	52.40	33.59	81.88	26.50	43.94	26.22	64.51	0.0259	0.0204	28.41	6
105	33.52	47.75	29.42	74.33	24.63	44.05	23.18	62.21	0.0425	0.0452	13.07	2
106	34.10	54.61	33.30	83.36	26.08	47.88	24.06	67.57	0.0619	0.0657	13.90	6
107	40.18	78.13	54.75	117.46	28.97	58.79	32.97	82.94	0.0472	0.0361	73.33	22
108	37.43	55.17	52.51	96.63	27.81	46.40	46.47	80.76	0.0398	0.0490	44.56	12
109	35.35	50.13	32.01	79.25	26.45	45.07	24.26	65.28	0.0511	0.0550	20.20	6
110	34.98	60.40	43.68	94.98	27.46	47.10	25.59	68.62	0.0289	0.0285	30.63	12
111	32.97	53.59	58.14	96.58	23.88	44.46	48.21	78.27	0.0396	0.0473	34.32	13
112	33.17	48.21	32.47	75.59	24.56	42.16	23.91	60.46	0.0261	0.0229	11.31	10
113	32.06	49.48	55.52	90.55	23.92	41.68	48.30	75.52	0.0200	0.0278	17.35	5
114	31.11	47.23	33.64	75.09	23.05	41.09	23.51	59.30	0.0267	0.0292	6.82	6
115	34.12	61.57	42.47	94.52	23.47	50.16	27.12	70.14	0.0396	0.0367	32.87	21
116	35.48	49.95	49.33	89.81	25.42	46.79	45.57	79.47	0.0318	0.0423	32.90	5
117	34.55	50.95	29.00	77.64	26.08	45.63	23.14	65.42	0.0549	0.0586	17.29	2
118	33.71	60.95	38.21	91.48	26.66	49.88	23.86	69.82	0.0333	0.0361	17.38	13
119	33.16	59.82	59.00	103.49	23.42	45.80	46.56	79.13	0.0295	0.0370	22.19	14
120	32.00	54.72	38.87	84.04	23.27	44.81	26.07	63.33	0.0103	0.0122	18.02	12
121	32.58	53.58	37.49	83.83	23.44	44.35	24.72	62.93	0.0117	0.0174	15.23	12
122	32.85	64.70	42.65	95.19	23.63	47.93	24.96	65.76	0.0833	0.1037	59.97	15
123	35.39	68.91	67.39	117.27	26.51	49.16	48.11	83.61	0.0481	0.0515	30.02	21
124	35.09	56.32	39.22	87.87	26.22	45.01	25.73	65.39	0.0340	0.0351	13.00	17
125	33.71	50.93	36.46	80.41	25.39	42.30	25.57	61.78	0.0243	0.0239	8.30	6
126	35.33	54.77	40.12	86.17	28.63	42.60	27.07	64.57	0.0432	0.0382	18.18	10
127	34.88	58.07	43.84	91.05	27.54	42.69	28.72	64.89	0.0603	0.0599	25.45	11
128	32.19	52.46	36.36	81.37	24.76	41.90	26.53	62.08	0.0292	0.0326	16.80	5
129	29.30	46.66	30.47	71.02	23.88	41.52	22.78	59.27	0.0270	0.0276	7.69	4
130	28.50	55.54	39.96	84.26	21.47	44.50	24.76	62.08	0.0257	0.0280	5.50	8
131	30.00	55.08	37.81	83.49	22.16	43.52	23.64	60.85	0.0164	0.0224	17.92	6
132	29.15	54.68	52.67	91.83	22.20	43.02	44.71	73.32	0.0305	0.0361	23.06	4
133	30.61	61.81	53.20	98.56	22.90	45.49	28.30	65.07	0.0831	0.0863	51.20	15
134	30.64	53.31	39.17	83.66	23.49	43.67	23.66	61.61	0.0511	0.0597	15.86	14
135	30.37	51.84	45.28	85.96	23.77	42.08	29.72	64.09	0.0189	0.0176	13.33	9
136	47.12	73.56	98.23	146.66	48.27	57.25	71.36	115.69	0.1194	0.1217	2.73	12
137	32.76	63.49	48.69	98.81	27.11	46.04	27.05	67.65	0.0747	0.0697	1.39	16
138	38.11	69.98	48.24	105.88	24.44	58.18	33.79	80.32	0.0928	0.0969	72.33	28
139	32.60	53.56	34.07	80.94	24.17	44.62	23.08	61.89	0.0338	0.0364	25.24	7
140	34.80	48.12	34.32	78.20	27.92	41.29	22.67	61.30	0.0389	0.0379	12.94	7
141	34.08	50.00	39.92	81.89	28.72	43.65	28.04	66.13	0.0457	0.0490	8.62	4
142	30.29	51.31	37.03	79.66	23.05	43.27	24.64	61.10	0.0352	0.0391	22.79	5
143	30.56	53.10	75.51	108.77	24.36	42.75	66.16	91.03	0.1524	0.1771	56.44	8
144	32.63	56.97	66.30	104.22	27.18	46.67	56.29	86.07	0.0797	0.0968	13.58	29
145	45.57	107.50	84.48	163.46	30.57	85.65	52.15	117.53	0.1795	0.1528	122.23	93

146	41.03	79.19	58.14	121.44	28.63	59.24	29.41	81.26	0.0866	0.0675	58.72	28
147	38.04	62.14	43.92	96.85	28.46	47.53	23.83	67.67	0.1046	0.0923	51.02	15
148	38.24	53.96	35.44	85.37	31.52	43.73	21.85	64.63	0.0826	0.0676	17.39	8
149	36.90	54.41	39.62	88.12	29.33	44.60	23.54	65.66	0.0902	0.0810	26.47	9
150	35.85	61.24	45.92	97.35	28.37	47.05	23.07	67.03	0.0728	0.0599	17.81	24
151	34.64	70.20	68.35	118.38	26.52	50.39	51.50	87.06	0.0993	0.0956	20.57	22
152	30.77	53.16	34.43	79.68	21.37	43.60	25.05	60.83	0.0162	0.0182	30.82	10
153	30.58	54.75	34.88	80.92	22.91	42.64	24.30	60.30	0.0143	0.0141	27.68	8
154	31.20	49.52	52.95	89.57	25.13	41.48	46.20	75.59	0.0152	0.0166	13.74	6
155	32.19	58.15	59.82	101.21	25.54	43.15	47.01	77.74	0.0298	0.0278	21.73	11
156	31.50	50.82	34.74	78.16	24.38	42.63	23.72	60.73	0.0182	0.0148	18.22	12
157	31.07	68.36	55.64	105.84	22.44	46.13	31.85	67.55	0.0112	0.0136	27.66	24
158	28.20	53.87	37.56	81.27	21.20	43.00	25.08	60.64	0.0025	0.0118	18.08	15
159	30.36	53.34	36.43	81.31	23.61	43.27	22.52	60.40	0.0408	0.0451	6.85	11
160	38.31	79.22	81.30	137.16	28.85	56.28	52.74	94.07	0.0800	0.0739	5.83	64
161	37.74	49.27	31.07	78.47	29.39	45.83	24.48	66.55	0.0595	0.0553	21.87	5
162	36.83	66.56	59.50	111.04	28.97	52.31	30.99	76.29	0.1158	0.1194	40.38	21
163	36.28	61.48	112.93	148.41	28.87	47.35	99.45	125.49	0.0842	0.1007	17.44	25
164	35.95	53.93	38.01	85.97	28.58	45.37	26.78	67.28	0.0672	0.0694	20.93	15
165	30.94	55.02	40.33	84.91	24.06	42.98	24.65	61.49	0.0463	0.0444	16.75	10
166	29.89	59.06	59.92	100.45	23.89	45.03	47.06	77.08	0.0263	0.0346	5.57	29
167	30.44	56.24	63.26	101.79	22.99	45.17	48.18	78.81	0.0256	0.0411	37.14	23
168	29.86	47.25	31.02	72.38	22.15	42.13	23.57	59.13	0.0231	0.0218	27.41	5
169	31.73	46.48	32.22	73.74	26.97	41.07	23.39	61.06	0.0333	0.0275	6.80	6
170	36.84	49.59	38.07	82.94	32.92	44.02	24.84	67.61	0.0719	0.0764	0.79	10
171	35.02	49.79	34.29	79.50	30.22	42.17	25.55	65.23	0.0518	0.0522	10.02	6
172	29.62	48.80	37.99	78.06	23.83	40.42	25.24	59.96	0.0310	0.0258	10.21	6
173	28.20	48.61	35.23	75.79	22.67	42.89	23.95	60.54	0.0189	0.0199	13.49	6
174	27.84	52.71	54.90	90.45	22.78	41.97	46.86	73.76	0.0562	0.0739	0.80	11
175	30.26	64.33	50.14	99.47	24.66	47.67	27.93	67.58	0.0460	0.0567	5.19	27
176	31.37	55.39	38.25	84.47	23.56	43.83	25.87	62.72	0.0326	0.0336	37.56	15
177	30.53	47.03	32.39	73.30	24.46	41.22	22.88	58.97	0.0304	0.0288	2.41	6
178	36.09	89.58	80.66	142.66	26.84	58.31	51.89	93.83	0.1030	0.0986	32.16	40
179	33.69	59.11	53.29	97.62	24.05	46.81	37.82	72.29	0.0574	0.0625	38.30	18
180	34.83	58.56	69.94	110.91	27.09	45.97	54.84	86.69	0.1313	0.1218	49.74	10
181	36.54	62.96	51.33	103.17	28.70	46.43	28.13	69.61	0.1075	0.0960	41.08	8
182	32.42	50.35	42.24	84.52	26.23	42.99	27.20	64.30	0.0644	0.0539	5.79	4
183	30.10	51.73	33.34	77.07	24.09	41.07	23.51	58.98	0.0056	0.0152	15.33	7
184	30.25	46.35	29.40	70.23	25.88	40.83	21.89	58.71	0.0211	0.0227	2.30	4
185	29.12	52.62	36.77	79.48	24.96	41.52	24.51	60.56	0.0074	0.0024	6.94	8
186	27.69	55.44	36.48	81.73	22.40	43.37	24.08	60.84	0.0170	0.0126	11.84	8
187	26.58	57.02	40.13	85.10	20.73	43.33	24.97	60.66	0.0159	0.0130	18.80	9
188	26.79	48.19	37.86	76.22	20.81	41.40	24.74	59.05	0.0246	0.0224	18.59	5
189	29.20	48.06	32.10	73.03	24.08	39.82	22.43	57.44	0.0132	0.0144	11.75	5
190	29.84	47.79	36.42	77.01	24.89	41.83	23.83	60.53	0.0329	0.0347	13.20	6
191	32.72	48.71	34.05	77.03	29.26	41.46	23.32	62.23	0.0388	0.0355	4.65	6
192	31.95	58.26	45.54	91.78	28.97	42.09	26.56	64.82	0.0588	0.0634	14.04	20
193	30.23	68.23	60.44	110.34	25.69	49.27	27.83	69.83	0.0739	0.0770	27.45	34
194	32.10	50.81	37.00	80.14	26.16	45.36	27.73	66.10	0.0141	0.0310	18.04	9
195	31.69	59.97	69.21	110.00	24.64	45.73	49.01	81.25	0.0494	0.0478	17.56	42
196	32.46	69.62	55.55	108.53	24.64	49.57	30.74	70.74	0.0433	0.0577	10.14	51
197	55.51	133.64	98.00	199.10	36.07	103.88	60.92	142.89	0.1906	0.2352	93.47	164
198	62.29	121.43	60.51	171.89	42.96	123.96	42.92	151.55	0.1311	0.1069	61.41	50
199	55.24	60.65	33.45	99.72	46.76	61.11	27.65	90.25	0.1475	0.1422	32.86	8
200	47.50	59.38	37.14	95.34	41.68	50.52	26.18	78.05	0.1046	0.1038	31.46	12
201	44.68	58.09	38.27	93.77	39.42	49.16	27.48	76.48	0.0932	0.0953	20.60	14
202	47.85	90.77	66.02	138.44	37.88	71.37	40.44	101.58	0.1895	0.1846	73.81	36
203	37.72	53.16	37.04	85.60	25.74	50.17	26.13	69.59	0.0476	0.0482	31.42	7
204	35.24	68.00	51.51	106.75	24.37	54.61	29.44	75.62	0.0696	0.0669	30.64	12
205	35.87	66.60	43.61	100.32	25.97	53.76	28.01	74.16	0.0597	0.0643	7.40	23
206	36.29	58.09	39.49	90.58	26.47	49.60	28.27	70.77	0.0399	0.0396	29.86	5
207	34.27	53.01	34.40	81.62	25.38	44.90	23.89	63.41	0.0322	0.0310	32.83	5
208	34.14	69.18	53.76	107.57	24.79	51.50	32.39	74.26	0.0675	0.0628	20.81	19
209	37.53	51.99	52.20	93.84	28.68	47.13	46.89	82.04	0.0572	0.0622	32.61	7
210	41.43	77.46	62.33	125.21	32.65	51.33	29.94	78.17	0.0266	0.0286	57.65	32
211	45.27	79.83	55.71	124.45	36.78	56.86	32.95	86.37	0.0196	0.0065	81.92	27
212	37.29	52.33	34.39	83.04	27.55	44.38	24.77	64.77	0.0161	0.0290	36.72	8
213	36.11	63.01	48.88	99.69	27.87	47.52	30.47	70.57	0.0154	0.0078	15.22	21
214	35.10	57.14	46.88	93.71	25.45	47.31	28.19	68.45	0.0415	0.0470	33.43	12
215	34.38	58.85	41.97	91.65	24.24	45.49	26.38	65.54	0.0296	0.0331	45.82	10
216	32.83	51.72	37.65	82.17	23.45	42.65	24.16	61.12	0.0127	0.0159	31.80	9

217	35.21	62.56	46.12	98.11	26.36	49.44	27.89	71.05	0.0097	0.0075	49.00	17
218	38.29	62.58	51.77	104.58	30.81	50.42	30.40	76.91	0.0374	0.0424	43.18	25
219	34.82	62.18	45.15	96.07	23.74	48.61	28.97	68.85	0.0590	0.0644	44.61	16
220	33.30	50.65	36.41	80.52	23.93	43.79	24.93	62.39	0.0270	0.0273	14.29	7
221	33.62	49.05	33.85	77.49	25.27	42.99	24.59	62.03	0.0425	0.0476	14.53	6
222	33.77	48.05	33.36	76.71	24.68	42.79	24.42	61.53	0.0368	0.0395	20.67	5
223	33.96	67.01	57.20	108.08	24.10	51.48	30.35	73.26	0.0706	0.0706	47.08	25
224	45.27	99.16	76.22	153.97	26.11	75.55	42.43	102.33	0.1351	0.1380	89.26	47
225	57.60	144.86	119.67	225.28	37.13	121.94	71.20	164.79	0.2808	0.2802	128.82	123
226	44.22	57.29	33.74	91.28	31.29	53.16	24.98	74.64	0.0746	0.0654	36.14	19
227	41.03	51.01	52.92	97.16	30.57	48.61	46.29	84.55	0.0672	0.0629	31.49	12
228	45.90	51.88	35.21	87.97	38.12	45.60	25.28	71.97	0.1122	0.1157	20.77	8
229	44.71	50.95	37.12	87.51	38.07	45.59	25.37	72.08	0.0953	0.0963	17.94	7
230	42.34	49.30	42.40	88.64	34.42	43.03	36.90	75.46	0.0812	0.0726	41.70	6
231	37.15	40.31	27.48	70.17	28.27	38.38	21.43	58.60	0.0532	0.0435	11.80	3
232	36.30	41.92	29.99	72.07	28.03	38.43	22.94	59.29	0.0508	0.0453	7.68	4
233	35.93	40.92	32.66	72.49	27.71	37.80	25.56	59.65	0.0566	0.0508	5.34	4
234	35.93	58.00	49.50	97.10	27.28	45.57	24.69	66.15	0.0803	0.0734	26.38	10
235	35.60	46.01	27.54	72.23	26.38	41.82	22.82	60.62	0.0288	0.0266	19.16	2
236	35.31	49.93	56.15	94.71	26.49	43.64	46.53	78.53	0.0413	0.0473	37.46	7
237	33.35	50.52	32.55	78.08	24.39	41.82	22.83	60.44	0.0153	0.0106	34.81	8
238	34.05	46.95	27.95	72.84	25.66	42.69	20.91	60.19	0.0190	0.0205	13.10	3
239	33.61	49.77	32.83	77.65	25.23	42.22	23.63	61.32	0.0295	0.0273	29.02	5
240	34.10	46.06	29.58	73.06	26.98	41.03	22.01	59.98	0.0113	0.0108	3.48	7
241	35.37	55.17	46.99	92.79	26.70	45.49	29.02	68.58	0.0216	0.0161	1.71	27
242	40.39	71.05	55.96	112.52	28.63	51.24	34.81	77.43	0.0936	0.1019	43.17	35
243	38.74	49.45	37.73	83.37	28.25	43.89	26.37	65.79	0.0361	0.0375	18.71	12
244	36.61	53.99	42.92	88.68	26.44	45.11	28.67	67.14	0.0359	0.0382	22.14	14
245	35.84	56.51	39.18	88.32	25.20	46.91	26.66	67.30	0.0280	0.0365	25.37	16
246	37.90	75.19	55.34	114.98	25.84	54.96	32.86	77.75	0.0497	0.0527	57.84	23
247	35.51	45.98	29.15	74.30	25.27	42.17	23.44	61.37	0.0319	0.0349	22.24	7
248	41.68	55.63	40.68	92.50	32.51	49.37	30.23	75.15	0.0346	0.0297	2.92	18
249	37.54	51.61	58.09	98.34	28.20	47.59	50.46	85.08	0.0990	0.1008	59.18	7
250	38.39	45.74	32.70	78.48	30.90	41.58	21.86	63.18	0.1052	0.1084	12.62	12
251	38.94	58.88	52.17	100.08	28.63	44.99	27.00	66.97	0.1179	0.1229	48.06	15
252	37.12	55.46	47.53	94.21	27.06	46.48	25.07	66.82	0.0500	0.0459	6.04	17
253	35.72	46.84	27.58	73.14	26.29	42.61	22.88	61.48	0.0222	0.0257	15.48	5
254	34.44	45.43	27.57	71.23	26.04	41.92	22.30	60.40	0.0178	0.0200	11.60	4
255	33.08	45.45	28.05	71.01	25.38	42.33	22.04	60.21	0.0271	0.0269	19.85	4
256	37.37	65.16	51.23	104.49	27.20	54.08	31.69	78.53	0.0921	0.0876	10.78	21
257	43.48	53.94	36.83	88.11	34.45	45.91	27.88	71.09	0.0805	0.0807	32.22	10
258	39.94	50.43	33.90	81.72	31.35	44.46	24.79	66.35	0.0681	0.0689	20.60	4
259	34.04	49.38	32.09	77.41	26.39	43.68	22.85	62.51	0.0215	0.0214	5.54	12
260	35.90	62.12	50.71	100.69	25.17	50.81	32.37	73.89	0.0541	0.0552	8.79	29
261	44.48	86.53	59.84	129.79	30.83	70.38	42.02	98.29	0.0683	0.0874	4.33	56
262	53.25	88.50	55.46	135.75	35.02	87.46	37.36	113.90	0.0620	0.0348	33.49	70
263	44.29	68.83	47.46	108.39	28.80	58.19	32.84	83.10	0.0815	0.0751	33.22	30
264	42.33	52.92	34.87	87.20	29.18	48.04	26.62	70.32	0.0586	0.0605	35.83	12
265	43.22	51.94	35.76	86.34	32.96	45.34	26.67	69.18	0.0756	0.0746	25.52	9
266	40.50	49.32	32.82	80.64	30.65	43.35	26.13	66.33	0.0523	0.0515	20.37	6
267	38.47	46.84	32.12	77.90	27.85	42.47	24.85	63.53	0.0325	0.0261	24.77	7
268	35.91	51.18	35.36	82.62	25.48	44.79	25.32	64.97	0.0262	0.0317	5.23	12
269	38.85	63.82	50.92	103.74	26.48	50.77	33.30	75.11	0.0463	0.0495	29.97	19
270	41.82	64.68	53.08	106.92	28.54	52.22	33.35	77.19	0.0766	0.0772	34.74	24
271	39.19	54.20	38.87	87.70	28.09	46.32	29.30	68.80	0.0616	0.0659	40.03	11
272	40.31	52.04	43.99	90.11	28.85	45.22	29.66	68.97	0.0863	0.0860	25.18	12
273	42.01	49.44	34.41	83.34	32.62	44.68	26.32	68.65	0.0724	0.0725	11.33	7
274	45.74	86.16	67.17	133.74	31.16	63.31	41.71	92.76	0.1584	0.1672	47.69	51
275	43.25	52.79	35.42	86.72	30.62	46.93	27.32	69.72	0.0656	0.0601	31.87	13
276	40.29	56.54	43.43	93.20	29.36	46.43	29.20	70.56	0.0736	0.0679	18.48	10
277	116.31	141.20	75.86	238.38	123.96	110.10	50.59	205.36	0.7436	0.5946	0.80	30
278	53.24	98.48	74.05	153.66	36.92	84.99	51.88	121.72	0.2065	0.1942	12.37	63
279	73.01	124.51	86.71	189.34	49.82	115.73	59.16	154.25	0.3537	0.3529	91.94	116
280	53.64	55.44	28.76	93.54	38.20	58.17	25.78	83.01	0.1020	0.0916	31.29	4
281	45.14	54.03	33.44	87.77	32.91	48.33	27.06	72.20	0.0917	0.0884	29.55	4
282	41.75	46.26	28.58	77.42	30.13	43.23	24.05	65.01	0.0602	0.0588	23.13	2
283	38.73	46.63	31.29	77.58	28.17	42.26	23.64	62.76	0.0460	0.0446	14.82	4
284	37.33	56.31	41.61	89.59	26.08	45.71	27.41	66.07	0.0614	0.0521	37.26	8
285	37.85	60.99	48.15	97.80	25.49	47.16	31.33	70.20	0.0623	0.0603	53.99	15
286	39.13	47.79	33.88	79.65	28.68	43.21	27.26	65.43	0.0582	0.0578	26.03	6
287	40.67	63.86	63.98	113.36	27.09	51.71	46.51	84.98	0.0870	0.0841	52.80	36

288	47.13	89.36	76.49	145.54	29.72	74.91	51.34	110.06	0.1726	0.1633	84.38	45
289	40.82	54.03	34.26	86.59	27.63	48.20	25.13	68.29	0.0447	0.0502	24.61	8
290	39.40	52.53	35.07	84.74	26.34	45.86	24.88	65.88	0.0663	0.0780	28.88	10
291	39.32	50.45	36.17	83.65	28.98	42.95	27.07	65.86	0.0736	0.0785	22.91	11
292	42.70	53.44	37.99	88.57	34.16	44.43	27.90	70.53	0.0787	0.0822	18.67	9
293	40.09	51.94	33.33	83.73	31.00	43.86	25.12	66.56	0.0629	0.0619	18.44	9
294	34.30	46.70	43.86	82.58	24.82	42.60	41.72	72.86	0.0106	0.0147	25.14	3
295	32.98	46.86	43.19	81.70	24.27	42.93	40.49	72.08	0.0226	0.0258	22.89	3
296	35.37	56.73	45.60	92.70	25.56	47.25	30.53	70.33	0.0837	0.0930	1.55	16
297	39.72	54.03	41.03	89.41	28.09	46.70	29.38	69.29	0.0494	0.0456	34.64	15
298	40.36	54.51	40.48	89.94	30.10	46.57	29.51	70.54	0.0786	0.0768	33.47	9
299	39.71	52.88	50.67	94.68	30.18	45.51	42.73	78.99	0.0707	0.0686	25.49	6
300	38.50	59.17	41.17	92.58	28.21	46.70	29.52	69.37	0.0978	0.0985	46.52	8
301	47.45	72.74	34.16	107.03	41.67	65.33	29.38	94.39	0.0716	0.0880	96.40	4
302	38.27	60.72	37.93	93.44	31.35	50.95	22.47	71.42	0.0490	0.0484	1.41	20
303	48.14	93.13	67.49	140.89	31.74	77.45	37.92	102.17	0.1617	0.1479	56.55	34
304	40.74	62.85	43.70	99.35	29.68	52.56	27.55	74.34	0.0651	0.0728	1.18	15

APPENDIX B. LATE CALIBRATION DAILY RESULTS

This data has the same format as that in APPENDIX A, except that it is based on the late calibration.

005	33.91	65.16	179.19	207.54	22.09	57.56	186.63	205.56	0.1631	0.1872	85.25	19
006	32.07	54.65	39.96	86.71	22.21	45.14	22.19	62.02	0.0760	0.0801	7.07	19
007	32.29	47.90	28.34	74.01	23.45	41.62	16.92	56.46	0.0328	0.0418	9.13	10
008	31.44	52.05	156.93	179.38	23.38	45.82	169.50	184.73	0.2012	0.2409	74.59	5
009	29.98	47.10	61.71	92.88	22.53	42.49	63.59	87.38	0.0110	0.0228	18.23	3
010	29.06	57.93	150.31	175.10	21.53	48.86	161.18	176.77	0.0984	0.1231	4.85	6
011	31.10	67.58	49.24	104.07	22.74	53.97	26.64	73.29	0.0639	0.0698	46.25	24
012	35.37	59.19	56.68	102.40	25.10	52.57	49.35	85.97	0.0523	0.0386	5.39	10
013	33.62	53.75	28.70	79.65	24.84	46.25	17.84	61.44	0.0606	0.0704	4.15	9
014	29.88	50.60	64.76	98.83	21.53	42.89	65.27	88.96	0.0579	0.0644	24.52	8
015	29.76	49.80	73.93	104.64	21.54	41.51	78.01	97.76	0.0641	0.0829	15.31	6
016	29.38	55.59	171.23	194.40	21.32	48.30	182.34	197.48	0.1316	0.1489	32.57	6
017	29.48	51.01	95.36	122.69	21.61	43.53	100.28	118.75	0.0472	0.0548	2.30	3
018	30.51	54.47	105.48	134.58	23.12	46.36	108.73	128.87	0.0453	0.0506	5.30	3
019	31.13	50.38	56.66	93.13	24.10	42.90	52.20	80.22	0.0246	0.0196	8.41	5
020	31.52	52.18	60.11	96.61	23.60	41.40	52.59	79.08	0.0514	0.0480	6.80	10
021	31.86	46.21	99.54	124.79	25.05	42.07	105.65	124.12	0.0560	0.0706	7.62	2
022	34.46	66.10	72.41	116.57	25.30	50.66	52.73	86.94	0.0307	0.0326	18.64	22
023	42.24	79.42	86.88	141.53	26.44	68.27	72.80	115.85	0.0983	0.0811	0.34	29
024	36.59	61.99	78.49	120.83	26.71	53.14	66.91	100.35	0.0635	0.0534	23.85	13
025	31.99	58.67	62.86	104.15	21.98	46.69	51.49	82.15	0.0897	0.0892	26.21	7
026	31.97	51.83	58.57	95.69	22.58	44.20	52.11	80.61	0.0336	0.0272	9.40	8
027	30.65	59.18	41.69	90.06	22.76	45.82	21.58	62.12	0.0205	0.0399	14.55	17
028	33.82	61.57	46.30	95.95	22.89	46.67	21.63	63.14	0.0938	0.1008	21.83	32
029	34.11	60.67	48.84	97.26	22.75	45.82	20.16	61.27	0.0451	0.0521	2.36	30
030	33.06	55.41	63.00	101.63	24.03	46.60	53.16	83.32	0.0506	0.0555	17.09	15
031	33.73	52.40	104.24	133.26	24.17	45.94	106.71	126.99	0.0577	0.0736	17.02	10
032	32.63	49.09	56.42	91.79	25.61	43.08	53.12	81.22	0.0414	0.0499	7.05	8
033	33.26	47.91	28.08	74.01	25.87	41.78	16.75	58.59	0.0550	0.0590	17.24	8
034	32.51	52.06	58.18	95.24	25.55	43.85	52.60	81.28	0.0529	0.0571	8.66	10
035	30.36	47.00	23.95	69.60	22.80	40.80	15.95	55.73	0.0268	0.0280	10.37	5
036	30.72	49.82	36.33	80.91	23.50	43.03	19.78	60.56	0.0206	0.0328	41.10	12
037	33.78	68.18	51.23	105.14	22.91	50.15	22.64	67.36	0.0637	0.0612	3.78	34
038	35.13	58.55	49.46	97.01	23.37	47.78	24.77	66.44	0.0674	0.0738	4.23	31
039	34.64	52.92	42.44	87.72	24.22	44.18	22.17	62.34	0.0561	0.0599	5.98	15
040	33.99	53.78	35.54	83.88	24.80	44.49	19.95	61.77	0.0808	0.0858	11.93	11
041	33.70	51.99	34.06	80.51	24.74	43.62	21.54	61.43	0.0519	0.0532	7.34	10
042	32.68	57.05	43.61	90.85	24.41	46.75	21.13	63.60	0.0695	0.0678	21.53	17
043	45.79	95.37	95.68	162.49	27.61	79.01	64.37	120.04	0.1483	0.1350	1.18	60
044	38.98	62.45	68.14	113.82	26.99	57.16	52.99	92.42	0.1127	0.1129	14.18	14
045	39.59	69.17	58.98	114.36	26.72	54.78	26.09	74.85	0.0809	0.0721	19.91	33
046	38.09	54.56	57.22	102.05	26.56	48.54	41.99	81.76	0.0059	0.0039	15.69	17
047	37.40	56.37	148.09	178.26	30.89	49.24	151.58	173.68	0.1041	0.1298	48.84	7
048	34.67	50.30	65.62	100.26	25.50	47.09	54.05	85.08	0.0733	0.0880	7.39	6
049	33.53	47.56	30.18	74.77	24.99	45.43	20.55	62.40	0.0315	0.0378	4.32	1
050	32.22	46.50	34.56	75.61	24.92	43.08	24.03	62.01	0.0285	0.0258	5.53	3
051	31.77	49.05	36.15	77.95	24.85	44.94	23.97	63.21	0.0117	0.0116	14.84	5
052	31.26	56.12	46.64	90.99	24.19	47.20	25.49	66.66	0.0187	0.0190	14.31	21
053	31.33	46.57	30.33	72.92	25.33	43.04	21.02	60.86	0.0534	0.0648	14.89	6
054	30.98	53.44	31.35	79.57	25.60	44.15	18.11	60.85	0.0248	0.0322	9.45	11
055	33.37	58.72	43.65	92.80	25.94	45.30	17.99	61.82	0.0403	0.0395	15.22	30
056	32.21	52.23	36.91	81.96	22.09	42.65	18.49	57.32	0.0388	0.0390	8.57	20
057	30.69	53.86	58.31	95.96	21.88	43.75	47.22	75.96	0.0510	0.0503	14.42	16
058	30.99	50.17	29.18	74.95	22.36	42.35	16.99	56.29	0.0030	0.0036	7.79	13
059	35.22	52.54	33.60	82.25	27.15	43.56	17.03	60.43	0.0136	0.0169	15.88	16
060	32.10	47.22	48.90	84.00	23.92	41.58	45.84	73.65	0.0179	0.0260	13.81	7
061	34.07	60.91	44.03	94.69	24.68	46.26	20.71	63.10	0.0433	0.0350	13.81	21
062	32.96	51.17	29.01	76.43	22.82	43.11	18.34	58.10	0.0260	0.0295	1.40	11
063	31.56	46.81	24.69	69.95	23.50	41.80	16.61	56.64	0.0139	0.0168	1.07	5
064	30.43	46.15	20.62	66.30	23.45	41.55	15.16	55.57	0.0105	0.0141	4.63	3
065	30.20	49.09	27.43	72.65	23.22	42.07	15.87	56.06	0.0077	0.0128	1.74	6

066	30.08	57.69	35.37	84.52	22.72	43.35	17.72	58.25	0.0159	0.0236	1.35	12
067	31.63	61.12	43.61	91.67	21.85	45.99	22.61	61.58	0.0588	0.0570	27.18	16
068	31.61	62.12	45.53	94.58	22.15	46.60	21.94	62.65	0.0364	0.0221	7.96	14
069	32.42	49.41	23.27	71.14	23.52	43.29	16.27	57.38	0.0552	0.0574	7.66	4
070	32.26	54.30	58.32	96.89	23.76	45.55	46.76	78.16	0.0498	0.0456	16.10	9
071	33.65	58.16	45.27	91.90	23.34	47.01	22.05	63.07	0.0578	0.0488	3.73	13
072	31.33	58.23	35.68	84.46	22.04	43.82	19.18	58.36	0.0346	0.0319	6.32	19
073	32.02	49.07	27.53	73.32	22.83	42.09	17.94	56.81	0.0154	0.0193	11.55	4
074	32.64	50.59	30.61	76.04	24.96	42.60	17.68	58.07	0.0148	0.0228	6.79	6
075	32.81	47.73	22.55	69.69	25.88	41.26	16.21	57.28	0.0342	0.0416	0.51	2
076	31.04	45.11	19.64	65.93	25.94	41.34	15.53	57.51	0.0409	0.0459	13.71	2
077	31.38	48.91	21.59	70.18	26.87	43.14	15.85	59.87	0.0396	0.0406	9.35	4
078	31.92	48.07	24.66	71.91	27.87	43.35	17.21	61.02	0.0481	0.0512	10.01	6
079	33.03	51.90	30.57	79.28	28.46	42.26	16.95	60.53	0.0223	0.0260	10.79	7
080	35.72	54.94	56.98	99.66	31.65	46.42	45.01	83.13	0.1197	0.1293	20.89	6
081	35.05	53.08	34.57	82.49	31.57	47.73	23.94	69.39	0.0860	0.0950	10.88	4
082	33.42	56.68	44.99	90.97	29.83	48.67	28.11	71.45	0.0953	0.1106	1.63	12
083	34.32	58.41	46.34	93.71	29.31	46.04	25.55	67.58	0.0738	0.0839	17.72	14
084	35.89	53.30	40.95	86.95	30.13	48.58	25.71	70.11	0.0676	0.0797	6.50	11
085	35.26	54.22	39.46	86.49	29.06	46.39	24.16	66.93	0.0799	0.0887	4.44	8
086	34.69	50.36	36.75	81.60	29.31	46.59	25.69	68.09	0.1043	0.1173	5.60	3
087	33.04	49.29	32.55	77.53	27.83	45.08	22.76	65.05	0.0342	0.0336	14.03	4
088	30.29	49.23	26.95	72.08	23.37	41.80	20.03	58.39	0.0156	0.0189	0.38	4
089	29.97	50.41	29.52	75.25	23.40	42.68	21.44	59.98	0.0026	0.0097	2.13	10
090	30.09	49.54	34.21	77.05	23.05	42.65	20.17	58.75	0.0260	0.0346	5.15	12
091	34.39	68.12	54.94	106.37	25.31	50.73	27.34	70.89	0.1234	0.1175	11.37	23
092	36.64	57.42	38.30	88.90	28.71	46.70	23.36	66.96	0.0750	0.0707	10.55	13
093	38.68	68.75	59.01	110.44	28.29	53.31	39.92	80.76	0.1287	0.1244	35.26	15
094	35.84	64.79	49.36	100.82	27.50	50.74	30.88	73.53	0.0867	0.0825	0.30	9
095	38.40	64.23	52.95	105.11	27.99	54.61	30.65	77.40	0.0576	0.0560	18.90	22
096	36.23	57.67	41.59	90.89	27.24	49.73	27.39	70.26	0.0672	0.0664	5.87	11
097	47.68	109.36	71.30	157.14	35.49	93.52	47.17	125.55	0.1453	0.1652	50.81	82
098	63.04	111.60	57.64	160.10	40.80	113.81	43.25	142.25	0.1440	0.1211	60.44	74
099	42.39	62.90	55.69	108.12	28.51	55.08	47.73	89.48	0.1249	0.1250	57.08	10
100	37.77	58.21	38.68	89.88	25.34	48.11	22.69	65.69	0.0717	0.0766	15.93	14
101	38.02	68.61	48.13	103.72	24.48	52.00	26.68	70.49	0.1049	0.1063	55.10	19
102	35.14	54.34	35.82	84.05	24.12	44.96	19.36	60.51	0.0604	0.0561	23.58	9
103	33.13	52.02	27.08	76.04	23.15	43.18	18.57	58.62	0.0376	0.0327	19.17	7
104	34.16	52.39	27.53	77.56	24.13	43.42	18.74	59.23	0.0252	0.0167	16.75	6
105	34.76	46.85	23.23	71.21	27.80	43.02	16.42	59.90	0.0356	0.0359	1.38	2
106	35.79	53.18	28.06	80.61	29.87	46.64	18.30	65.88	0.0582	0.0591	2.22	6
107	41.94	74.37	50.23	113.39	32.92	54.75	25.15	77.70	0.0524	0.0477	61.65	22
108	39.38	52.72	51.33	94.81	32.06	43.91	46.26	80.67	0.0564	0.0661	32.89	12
109	37.09	48.67	25.87	76.37	30.27	43.70	17.61	63.20	0.0462	0.0486	8.52	6
110	37.09	58.03	38.25	92.21	31.76	44.77	18.69	66.19	0.0250	0.0267	18.95	12
111	32.58	51.83	57.85	94.42	24.88	42.85	47.88	76.71	0.0609	0.0693	22.67	13
112	30.63	47.93	26.99	71.46	22.53	41.69	17.04	55.83	0.0244	0.0233	0.35	10
113	29.79	49.26	54.51	88.44	22.25	41.38	48.12	74.18	0.0401	0.0513	5.68	5
114	30.25	47.02	27.53	71.38	23.19	40.79	17.18	56.02	0.0071	0.0092	4.85	6
115	34.64	59.11	36.31	89.64	25.29	47.55	18.69	64.14	0.0447	0.0467	21.20	21
116	36.37	47.79	46.69	86.28	28.14	44.62	45.08	78.14	0.0518	0.0624	21.24	5
117	36.05	48.64	21.52	73.43	29.64	43.83	16.18	62.56	0.0548	0.0585	5.62	2
118	35.36	58.43	34.29	88.70	30.15	47.81	18.20	67.32	0.0283	0.0302	5.68	13
119	31.29	58.65	58.80	100.82	22.26	44.59	46.26	76.60	0.0519	0.0602	10.54	14
120	30.71	53.68	31.25	78.67	22.94	43.85	17.71	58.10	0.0160	0.0161	6.34	12
121	32.22	52.22	31.30	79.22	24.44	42.98	17.05	58.33	0.0225	0.0252	3.56	12
122	31.03	63.16	37.51	90.30	22.80	46.29	18.40	60.55	0.0745	0.0941	48.29	15
123	31.97	67.67	66.57	113.91	23.10	47.64	47.42	80.31	0.0561	0.0578	18.33	21
124	31.99	55.37	34.31	82.60	23.41	43.98	19.76	59.64	0.0289	0.0290	1.32	17
125	30.43	50.20	31.34	75.17	22.34	41.52	19.56	56.48	0.0184	0.0149	3.38	6
126	31.10	54.26	34.45	80.77	24.07	42.12	19.75	58.07	0.0478	0.0449	6.52	10
127	30.71	57.33	37.75	84.80	23.34	41.92	20.31	57.62	0.0652	0.0657	13.79	11
128	29.13	52.59	30.61	76.69	21.93	41.81	20.12	57.31	0.0275	0.0314	5.14	5
129	27.48	47.13	24.23	67.07	22.60	41.91	16.63	55.96	0.0214	0.0251	19.37	4
130	28.05	54.47	34.44	80.17	22.04	43.49	17.36	57.47	0.0103	0.0099	6.18	8
131	29.93	53.60	33.82	79.88	23.35	42.16	17.70	57.08	0.0189	0.0233	6.24	6
132	29.01	53.87	51.99	90.14	23.15	42.28	45.36	73.16	0.0451	0.0514	11.40	4
133	28.44	60.74	48.81	94.35	21.17	44.43	22.28	59.93	0.0824	0.0868	39.54	15
134	27.64	53.08	36.49	80.47	20.82	43.11	19.51	57.53	0.0510	0.0626	4.18	14
135	28.75	51.78	39.87	82.10	22.99	41.89	23.56	60.38	0.0155	0.0182	1.65	9
136	42.08	75.91	97.91	145.74	41.84	59.20	70.31	113.66	0.1308	0.1348	8.95	12

137	30.25	62.87	50.27	99.04	24.83	45.35	26.08	66.08	0.0846	0.0811	10.30	16
138	35.29	67.40	42.68	99.26	22.03	55.19	25.40	71.92	0.1000	0.1048	60.68	28
139	29.89	52.33	28.40	75.57	21.87	43.27	16.16	56.14	0.0369	0.0405	13.55	7
140	30.45	48.21	28.34	72.59	23.41	40.91	16.42	55.31	0.0346	0.0352	1.26	7
141	30.27	50.25	34.98	77.43	24.64	43.39	22.10	60.76	0.0533	0.0610	20.28	4
142	27.77	50.91	31.94	75.42	21.10	42.76	19.00	57.00	0.0328	0.0399	11.13	5
143	29.64	53.13	77.26	109.57	24.16	42.89	67.25	91.87	0.1745	0.2002	44.82	8
144	31.61	57.29	71.09	108.16	26.83	46.91	58.77	88.65	0.1010	0.1175	1.93	29
145	44.11	104.34	88.38	162.65	29.80	82.33	52.10	114.11	0.1906	0.1649	110.55	93
146	39.82	75.98	61.83	120.63	28.28	55.91	29.67	78.40	0.0958	0.0771	47.04	28
147	34.72	60.34	49.20	97.42	25.18	45.83	24.90	65.43	0.1195	0.1110	39.38	15
148	34.48	53.22	42.72	87.07	27.37	43.06	26.59	64.66	0.0994	0.0886	5.70	8
149	33.69	53.55	46.26	89.65	26.07	43.70	27.16	65.11	0.1085	0.1024	14.81	9
150	33.13	60.26	52.50	99.26	25.75	46.07	27.14	67.02	0.0907	0.0822	6.15	24
151	32.61	68.45	71.42	118.08	25.01	48.68	52.59	85.69	0.1197	0.1183	8.91	22
152	29.69	51.75	27.52	74.02	21.18	41.91	16.66	54.75	0.0220	0.0228	19.14	10
153	28.72	53.31	28.39	75.45	21.74	41.33	16.73	54.75	0.0244	0.0257	16.02	8
154	27.82	49.26	52.18	86.75	21.81	41.06	46.88	73.60	0.0361	0.0404	2.07	6
155	28.57	57.48	59.82	98.48	21.81	42.59	47.24	75.29	0.0477	0.0509	10.07	11
156	29.24	50.44	29.11	73.84	22.57	42.15	17.92	56.57	0.0200	0.0225	6.52	12
157	29.17	67.63	48.58	100.80	20.85	45.49	22.85	61.53	0.0283	0.0366	15.99	24
158	27.22	53.13	31.75	76.94	21.10	42.29	17.99	56.09	0.0201	0.0312	6.41	15
159	27.67	52.50	33.14	77.59	21.20	42.37	18.31	56.15	0.0464	0.0537	4.82	11
160	35.40	77.56	82.02	134.23	25.77	54.58	51.94	90.24	0.0866	0.0865	5.85	64
161	33.05	48.84	27.00	73.04	24.42	44.80	20.27	60.72	0.0707	0.0723	10.21	5
162	32.45	65.17	53.57	104.30	23.91	50.78	22.36	67.47	0.1169	0.1228	28.70	21
163	31.59	61.49	112.03	145.60	23.77	46.90	98.94	122.50	0.1016	0.1225	5.82	25
164	31.57	53.50	30.94	79.10	23.90	44.65	19.42	60.15	0.0720	0.0782	9.24	15
165	28.42	53.81	34.89	80.00	21.61	41.98	17.55	55.81	0.0457	0.0471	5.09	10
166	27.58	58.71	59.86	98.71	21.83	44.84	47.60	76.07	0.0442	0.0517	6.09	29
167	28.63	55.45	62.30	99.43	21.89	44.23	47.59	76.83	0.0477	0.0649	25.51	23
168	28.19	46.89	25.88	67.95	21.08	41.46	18.09	54.76	0.0160	0.0228	15.74	5
169	27.84	46.88	27.62	69.05	22.95	41.12	18.85	56.19	0.0306	0.0321	4.86	6
170	31.60	50.02	33.62	77.65	27.07	43.91	19.58	61.31	0.0700	0.0776	12.47	10
171	30.13	50.70	28.39	74.27	25.06	42.36	19.26	59.26	0.0527	0.0584	1.65	6
172	26.91	48.70	31.07	72.62	21.22	40.31	18.22	54.55	0.0250	0.0269	1.44	6
173	26.15	48.06	31.07	71.66	20.92	42.34	19.33	56.63	0.0058	0.0108	1.82	6
174	26.23	52.39	53.85	88.40	21.72	41.76	47.31	73.10	0.0668	0.0847	12.47	11
175	28.29	63.99	45.39	95.43	23.14	47.14	21.58	62.81	0.0237	0.0330	16.90	27
176	28.95	54.38	33.17	79.45	21.47	42.43	19.02	56.87	0.0336	0.0317	25.89	15
177	27.61	47.13	26.19	68.51	21.85	40.90	16.99	54.59	0.0148	0.0097	9.30	6
178	33.65	87.78	79.87	139.05	24.30	56.70	49.79	89.27	0.1095	0.1087	20.51	40
179	30.94	57.47	48.76	92.09	21.81	45.07	31.45	65.66	0.0660	0.0728	26.65	18
180	32.41	56.90	71.83	110.48	24.63	44.24	55.56	84.97	0.1535	0.1455	38.08	10
181	34.88	61.92	61.51	107.69	26.98	45.33	35.46	71.64	0.1264	0.1188	29.41	8
182	30.95	50.13	46.40	86.20	24.83	42.45	29.50	64.74	0.0767	0.0664	17.47	4
183	27.15	51.99	28.41	73.29	21.24	41.10	17.93	54.91	0.0211	0.0295	3.67	7
184	27.04	46.63	22.90	65.42	22.70	40.83	16.12	54.46	0.0043	0.0096	13.98	4
185	26.50	52.41	31.81	75.62	22.48	41.37	18.91	56.57	0.0165	0.0215	4.71	8
186	26.44	55.26	31.35	77.95	21.80	43.19	19.09	57.76	0.0058	0.0112	0.20	8
187	26.48	55.60	34.03	80.55	21.49	42.24	17.06	55.95	0.0090	0.0147	7.15	9
188	27.16	47.43	32.65	72.81	22.45	40.68	19.04	56.24	0.0130	0.0126	6.91	5
189	26.44	47.79	26.53	68.38	21.59	39.45	16.28	52.73	0.0257	0.0338	0.10	5
190	26.65	47.71	30.90	71.71	21.74	41.45	17.74	55.21	0.0263	0.0309	1.53	6
191	28.21	49.23	30.12	72.67	24.36	41.57	18.29	57.16	0.0355	0.0359	7.03	6
192	27.87	58.28	39.36	86.72	24.46	42.16	19.45	59.00	0.0598	0.0678	2.38	20
193	27.81	68.06	55.45	106.31	23.00	49.06	21.90	65.38	0.0717	0.0793	15.79	34
194	28.52	51.07	30.69	74.76	22.69	45.07	20.64	60.22	0.0348	0.0546	6.38	9
195	29.46	59.44	68.12	107.77	22.57	44.97	48.60	79.29	0.0529	0.0565	5.92	42
196	30.57	68.20	50.50	103.39	23.05	48.02	23.20	64.46	0.0210	0.0339	21.84	51
197	53.43	130.92	95.92	194.28	34.16	101.06	54.71	135.75	0.1708	0.2134	105.28	164
198	58.48	118.67	57.64	166.69	39.11	120.14	39.53	145.41	0.1480	0.1281	49.71	50
199	48.70	60.59	26.67	92.88	39.22	60.30	21.36	82.86	0.1513	0.1475	21.19	8
200	41.40	59.14	30.90	88.31	34.80	49.72	19.16	70.07	0.1076	0.1080	19.79	12
201	38.84	58.38	33.19	88.26	33.04	48.81	22.09	70.26	0.0952	0.0978	8.95	14
202	42.59	88.56	60.98	131.08	31.73	69.04	32.36	91.62	0.1905	0.1865	62.14	36
203	35.10	51.11	30.49	78.67	23.74	47.78	19.14	62.60	0.0563	0.0595	19.75	7
204	34.25	64.98	44.96	99.81	24.08	51.55	19.95	67.23	0.0614	0.0590	18.94	12
205	33.11	64.71	39.95	94.50	23.76	51.57	22.41	67.60	0.0495	0.0520	4.29	23
206	33.90	56.56	33.23	84.18	24.65	47.67	21.41	64.09	0.0413	0.0392	18.17	5
207	32.22	51.95	28.03	76.04	24.12	43.56	17.80	58.27	0.0347	0.0349	21.15	5

208	31.59	67.25	47.99	100.87	22.46	49.71	24.47	66.60	0.0700	0.0671	9.14	19
209	33.40	51.53	50.50	89.92	24.65	46.05	47.01	78.93	0.0773	0.0854	20.96	7
210	42.25	74.60	56.37	120.23	34.72	48.44	22.29	72.61	0.0068	0.0060	45.97	32
211	46.27	76.56	51.82	119.99	39.13	53.30	26.80	81.01	0.0420	0.0285	70.26	27
212	36.02	50.98	29.59	78.05	27.35	42.54	19.71	59.92	0.0063	0.0052	25.02	8
213	34.31	61.16	42.72	93.75	26.45	45.77	22.09	63.67	0.0273	0.0216	3.54	21
214	33.11	55.81	40.26	87.85	24.17	45.65	19.92	61.84	0.0413	0.0469	21.75	12
215	33.10	57.26	36.00	85.94	24.03	43.95	18.87	59.42	0.0357	0.0381	34.13	10
216	32.71	50.32	31.82	77.73	24.79	40.99	17.23	56.60	0.0099	0.0085	20.13	9
217	36.77	59.37	40.11	93.27	29.83	46.14	19.12	65.61	0.0126	0.0172	37.32	17
218	38.36	59.72	46.13	99.29	32.08	47.40	22.91	71.20	0.0240	0.0232	31.60	25
219	32.43	60.01	39.61	89.46	21.96	46.18	22.00	61.41	0.0621	0.0653	32.94	16
220	31.16	49.01	30.04	74.57	22.32	42.12	17.57	55.97	0.0230	0.0197	2.61	7
221	30.28	47.98	28.47	71.48	22.28	41.93	17.93	55.72	0.0422	0.0489	2.85	6
222	31.05	47.46	27.67	71.40	22.50	42.00	18.19	56.28	0.0365	0.0412	8.99	5
223	32.27	64.99	52.66	102.72	23.03	49.31	23.89	66.75	0.0697	0.0737	35.43	25
224	44.46	95.35	71.58	147.38	26.30	71.39	32.71	92.94	0.1389	0.1433	77.61	47
225	56.67	140.22	116.83	219.16	37.04	117.76	63.54	155.89	0.2822	0.2830	117.19	123
226	40.29	56.05	29.80	86.10	27.39	51.43	20.90	69.27	0.0807	0.0727	24.45	19
227	36.84	51.19	50.82	93.11	26.25	47.96	46.14	81.08	0.0786	0.0782	19.82	12
228	40.27	52.09	28.63	81.53	31.92	45.10	17.16	64.38	0.1155	0.1206	9.11	8
229	39.16	51.31	30.47	81.09	31.89	45.30	17.59	64.47	0.0947	0.0978	6.26	7
230	37.79	49.20	42.33	86.62	29.34	42.45	35.72	72.22	0.1026	0.0963	30.04	6
231	34.46	40.10	40.55	75.70	25.65	37.91	30.37	61.89	0.0729	0.0667	0.13	3
232	33.94	41.80	43.36	77.94	25.82	37.98	32.64	62.99	0.0723	0.0692	3.99	4
233	33.87	40.83	45.16	78.44	25.88	37.56	34.39	63.69	0.0788	0.0744	6.35	4
234	33.60	56.15	53.34	97.11	25.26	43.59	26.21	64.50	0.0845	0.0766	14.69	10
235	32.67	46.01	20.55	67.24	23.86	41.34	16.11	55.64	0.0316	0.0323	7.50	2
236	32.76	49.76	54.62	91.96	24.60	42.87	46.12	76.45	0.0590	0.0696	25.80	7
237	32.12	50.09	26.54	73.90	24.06	41.14	17.06	56.45	0.0203	0.0208	23.14	8
238	31.61	46.44	21.88	68.04	23.76	41.89	15.64	55.87	0.0221	0.0223	1.44	3
239	31.56	48.64	26.92	72.72	23.52	41.18	16.49	55.95	0.0376	0.0388	17.35	5
240	31.08	46.05	24.34	68.88	24.18	40.72	16.26	55.51	0.0114	0.0132	8.19	7
241	32.77	54.32	42.09	87.90	24.36	44.52	21.90	62.51	0.0157	0.0160	13.40	27
242	36.79	69.28	50.57	105.70	25.19	49.50	25.70	68.58	0.0951	0.1038	31.51	35
243	35.38	48.68	31.97	77.84	25.20	42.88	18.30	59.02	0.0370	0.0394	7.03	12
244	34.13	52.89	35.52	82.60	24.47	43.98	19.22	59.97	0.0397	0.0442	10.47	14
245	34.87	54.44	32.99	83.20	25.45	44.96	17.95	61.12	0.0072	0.0156	13.68	16
246	37.84	72.13	49.26	109.26	26.93	51.89	22.82	70.16	0.0587	0.0631	46.18	23
247	33.68	45.57	24.12	69.98	24.31	41.14	18.06	56.75	0.0180	0.0188	10.57	7
248	37.51	54.71	34.89	86.23	28.19	48.18	23.04	67.70	0.0370	0.0348	8.74	18
249	34.48	49.23	58.37	96.24	25.29	45.46	49.53	82.12	0.1158	0.1182	47.52	7
250	34.92	46.25	42.88	82.66	27.26	41.84	27.80	64.79	0.1273	0.1322	0.98	12
251	36.28	57.95	58.21	102.61	26.23	43.82	30.38	67.59	0.1352	0.1426	36.41	15
252	35.10	54.00	49.32	93.40	25.50	44.69	23.75	64.12	0.0498	0.0432	17.75	17
253	33.36	46.55	20.83	68.36	24.42	42.01	15.97	56.55	0.0014	0.0026	3.78	5
254	32.50	45.08	21.51	67.06	24.68	41.49	15.81	56.13	0.0059	0.0072	0.08	4
255	31.10	45.60	22.41	67.48	24.12	42.14	16.06	56.57	0.0064	0.0042	8.18	4
256	34.87	64.03	45.75	98.68	25.14	52.72	22.70	70.56	0.0863	0.0838	0.89	21
257	38.33	53.70	30.69	81.83	28.96	45.20	20.17	63.45	0.0858	0.0866	20.57	10
258	35.89	50.29	27.38	76.28	27.20	43.88	17.02	59.86	0.0713	0.0743	8.91	4
259	31.43	49.38	26.55	73.41	24.32	43.49	17.12	58.48	0.0017	0.0041	6.13	12
260	34.01	60.61	46.49	95.93	24.15	48.99	24.48	67.42	0.0355	0.0337	2.91	29
261	41.62	85.35	56.80	125.15	28.52	68.64	36.00	92.34	0.0511	0.0675	7.40	56
262	50.44	85.82	51.00	129.42	32.61	83.89	32.21	106.83	0.0679	0.0413	21.78	70
263	41.70	66.77	42.04	102.10	26.66	55.72	25.08	75.15	0.0837	0.0773	21.54	30
264	39.45	51.58	28.59	80.81	26.87	46.20	18.48	62.98	0.0618	0.0631	24.14	12
265	38.80	51.71	29.32	80.31	28.31	44.58	17.96	61.60	0.0776	0.0772	13.86	9
266	36.47	48.90	26.07	74.51	26.46	42.67	18.76	59.52	0.0544	0.0535	8.71	6
267	35.26	46.66	25.82	72.79	24.82	41.70	17.58	57.61	0.0387	0.0336	13.12	7
268	34.84	50.11	30.77	78.35	25.44	43.43	19.84	60.39	0.0044	0.0086	6.43	12
269	37.58	61.29	44.43	97.22	26.39	48.34	23.92	67.51	0.0413	0.0444	18.30	19
270	38.61	62.80	48.38	100.74	25.71	50.23	24.93	68.93	0.0798	0.0809	23.06	24
271	36.22	53.59	32.26	82.04	25.58	45.32	20.79	62.11	0.0670	0.0726	28.34	11
272	36.97	51.16	37.62	84.18	25.91	44.08	20.72	61.63	0.0865	0.0884	13.51	12
273	37.78	49.15	28.84	77.35	28.48	43.84	19.31	61.77	0.0707	0.0707	0.35	7
274	42.13	83.84	62.48	127.03	27.56	60.78	31.89	82.88	0.1540	0.1615	36.01	51
275	39.60	51.96	29.55	81.12	27.11	45.64	19.12	62.79	0.0695	0.0655	20.20	13
276	36.93	55.88	37.63	87.67	26.22	45.41	21.79	63.87	0.0701	0.0666	6.79	10
277	112.76	140.72	76.48	235.74	120.15	109.22	49.02	201.01	0.7477	0.6013	10.86	30
278	49.26	96.83	69.78	147.66	32.76	83.31	42.42	112.65	0.1961	0.1824	24.11	63

279	67.60	122.17	85.33	184.09	43.93	112.95	51.72	145.25	0.3482	0.3474	80.25	116
280	49.04	54.88	23.17	87.83	33.42	56.63	20.00	76.58	0.1047	0.0951	19.60	4
281	41.04	53.63	26.45	81.56	28.71	47.19	19.07	65.04	0.0895	0.0852	17.87	4
282	38.18	46.35	23.10	72.63	26.74	42.44	18.52	59.56	0.0593	0.0576	11.47	2
283	35.55	46.77	26.80	73.59	25.38	41.68	18.65	58.17	0.0409	0.0372	3.11	4
284	35.15	55.45	37.38	85.35	24.45	44.59	20.02	60.42	0.0644	0.0573	25.61	8
285	36.51	59.60	42.25	92.46	25.16	45.47	22.61	63.41	0.0634	0.0621	42.32	15
286	35.63	47.35	27.26	74.11	25.54	42.33	19.51	59.09	0.0601	0.0601	14.35	6
287	37.78	63.08	63.42	111.12	24.64	50.32	45.20	82.36	0.0982	0.1000	41.14	36
288	45.31	86.38	77.63	142.23	28.50	71.83	49.19	104.75	0.1741	0.1656	72.70	45
289	38.53	53.25	28.34	81.47	26.05	46.77	17.86	62.45	0.0348	0.0345	12.91	8
290	37.38	52.00	29.87	80.22	25.17	44.67	18.19	60.58	0.0495	0.0588	17.18	10
291	35.31	50.58	30.27	78.33	25.02	42.51	19.59	59.34	0.0649	0.0676	11.25	11
292	37.79	53.95	32.02	82.69	28.96	44.23	20.03	63.22	0.0770	0.0799	6.99	9
293	35.85	52.22	25.76	77.99	26.65	43.67	16.47	59.90	0.0585	0.0558	6.76	9
294	32.85	46.87	42.26	80.59	24.22	42.21	41.99	71.94	0.0322	0.0384	13.48	3
295	32.60	46.99	41.41	79.97	25.11	42.41	40.58	71.42	0.0131	0.0153	11.22	3
296	35.61	55.93	39.59	88.61	27.33	45.97	22.44	65.21	0.0614	0.0692	10.15	16
297	36.67	52.84	35.85	84.13	25.34	45.29	22.02	62.76	0.0532	0.0495	22.98	15
298	36.52	54.09	35.09	84.71	26.23	45.76	21.90	63.70	0.0768	0.0740	21.80	9
299	35.55	53.01	50.15	91.90	26.28	45.01	42.02	75.65	0.0810	0.0832	13.84	6
300	35.24	58.70	35.52	87.45	25.31	45.98	21.42	63.01	0.0928	0.0933	34.84	8
301	46.23	72.38	38.59	108.20	41.37	64.70	30.76	94.78	0.0515	0.0648	84.71	4
302	35.20	60.80	45.40	96.40	28.51	50.91	27.27	72.79	0.0671	0.0694	10.27	20
303	44.98	90.84	71.86	140.47	29.03	74.95	37.88	98.94	0.1679	0.1560	44.83	34
304	37.96	62.36	44.07	97.47	27.34	51.57	25.99	71.26	0.0527	0.0559	10.53	15

APPENDIX C. DIFFERENCING OF EARLY AND LATE CALIBRATION RESULTS

The columns of data below give the difference between the data columns in APPENDIX A and APPENDIX B, except for the first and last columns (day of year and Ap of day) which are the same and undifferenced. Sign convention is Late Calibration Results minus Early Calibration Results (APPENDIX H).

5	-2.92	1.20	3.41	2.11	-2.33	0.56	2.39	1.20	0.0217	0.0239	-11.58	19
6	-1.79	-0.22	-1.30	-2.03	-0.77	-0.65	-3.39	-3.17	-0.0125	-0.0142	-11.69	19
7	-0.05	-0.83	-1.28	-1.67	1.75	-1.15	-3.77	-2.06	-0.0199	-0.0227	-11.69	10
8	-0.65	0.89	0.45	0.05	0.80	0.08	0.59	0.30	0.0223	0.0240	-11.59	5
9	-4.16	1.16	1.01	-0.20	-3.81	0.57	1.12	0.04	-0.0043	-0.0103	11.72	3
10	-3.97	1.87	-0.70	-0.97	-3.59	0.99	-0.82	-1.34	0.0224	0.0236	-11.63	6
11	-3.69	0.58	-0.62	-2.33	-3.26	-0.03	-2.26	-3.62	-0.0205	-0.0234	11.73	24
12	-5.05	0.48	-0.85	-2.97	-5.08	-0.23	-0.27	-3.07	-0.0006	-0.0035	-0.93	10
13	-3.22	0.41	-1.83	-2.82	-2.85	-0.21	-2.25	-3.35	-0.0157	-0.0191	-11.73	9
14	-1.18	0.33	0.79	0.32	0.73	-0.07	0.42	0.69	0.0193	0.0226	-11.65	8
15	-0.43	0.91	-0.91	-0.15	1.54	0.11	-0.80	0.26	0.0194	0.0224	-11.61	6
16	-2.75	1.20	0.51	0.03	-1.96	0.48	1.19	0.50	0.0223	0.0230	-11.65	6
17	-2.25	1.16	-0.78	-0.73	-1.83	0.42	0.29	-0.24	0.0214	0.0192	-7.06	3
18	-4.21	1.51	0.90	-0.25	-4.04	0.85	1.28	-0.23	-0.0010	0.0084	-11.66	3
19	-4.59	1.74	1.15	-0.88	-4.49	0.93	1.39	-1.21	-0.0136	-0.0133	5.15	5
20	-4.20	1.33	2.59	-0.24	-4.10	0.54	2.16	-0.84	0.0013	0.0066	-11.68	10
21	-4.37	1.73	0.81	-0.47	-4.36	0.69	1.20	-0.67	0.0190	0.0231	-11.65	2
22	-3.74	0.85	3.24	0.37	-3.49	0.42	0.47	-1.47	-0.0029	0.0177	11.69	22
23	-5.40	0.74	2.02	-1.37	-5.41	-0.34	0.00	-3.40	-0.0069	-0.0074	-11.03	29
24	-2.78	0.41	3.12	-0.53	-2.46	-0.47	3.00	-0.92	-0.0139	-0.0168	-11.68	13
25	-2.65	0.26	1.87	-1.02	-2.26	-0.44	0.85	-1.93	-0.0116	-0.0118	-11.69	7
26	-2.87	0.99	1.54	-0.70	-2.37	0.09	1.52	-1.14	-0.0152	-0.0157	-11.68	8
27	-2.88	1.55	1.80	0.68	-2.11	1.36	-0.29	0.19	0.0013	0.0122	11.66	17
28	-2.95	-0.07	-1.70	-2.46	-2.42	-0.47	-5.93	-4.83	-0.0143	-0.0147	-11.70	32
29	-2.87	-0.27	-1.33	-2.34	-2.35	-0.57	-5.66	-4.69	-0.0128	-0.0138	-11.69	30
30	-3.34	0.63	3.29	-0.26	-2.98	0.03	1.82	-1.37	-0.0047	-0.0014	-11.65	15
31	-4.02	1.18	1.48	-0.13	-3.81	0.30	1.03	-0.91	0.0151	0.0206	-11.66	10
32	-4.20	1.61	2.50	0.02	-4.00	0.57	1.95	-0.87	0.0134	0.0194	2.43	8
33	-4.37	1.15	0.35	-1.72	-4.15	0.13	-2.57	-3.37	-0.0108	-0.0107	11.68	8
34	-4.13	1.39	2.50	-0.06	-4.08	0.46	2.01	-1.02	0.0052	0.0105	5.63	10
35	-2.02	0.56	-0.22	-0.29	-1.27	-0.03	-1.65	-0.81	-0.0210	-0.0221	9.05	5
36	-1.75	1.04	0.47	0.53	-0.66	0.14	-0.67	-0.15	-0.0156	-0.0119	11.70	12
37	-2.55	0.34	1.28	0.12	-1.80	-0.33	-1.38	-1.40	-0.0158	-0.0184	-4.16	34
38	-3.04	-0.03	0.27	-1.38	-2.47	-0.69	-3.13	-3.36	-0.0146	-0.0172	-3.25	31
39	-3.59	0.38	2.07	-0.77	-3.24	-0.44	-0.50	-2.45	-0.0135	-0.0162	0.23	15
40	-3.51	0.25	2.42	-0.62	-3.36	-0.41	-0.05	-2.05	-0.0009	0.0012	-11.69	11
41	-3.68	0.21	4.18	0.23	-3.57	-0.19	2.07	-0.83	-0.0005	-0.0005	3.01	10
42	-3.81	0.04	4.52	0.49	-3.59	-0.31	1.87	-1.22	-0.0108	-0.0121	11.70	17
43	-4.17	-0.65	6.66	1.82	-4.10	-1.12	3.94	-0.24	-0.0062	-0.0090	-26.76	60
44	-3.95	-0.22	4.21	-0.07	-3.89	-0.78	2.06	-1.70	0.0113	0.0136	-11.66	14
45	-3.59	-0.54	4.24	0.06	-3.60	-1.07	0.73	-2.54	-0.0019	-0.0028	11.73	33
46	-2.27	-0.19	5.44	1.39	-1.58	-0.95	2.63	-0.46	-0.0204	-0.0230	11.69	17
47	-1.68	-3.11	0.21	-2.40	-1.29	-2.87	1.10	-1.30	-0.0173	-0.0190	11.75	7
48	-0.76	-0.38	4.61	2.82	0.77	-0.72	2.18	1.76	0.0190	0.0221	-11.68	6
49	-0.46	0.25	8.80	4.47	0.81	-0.30	5.78	3.05	0.0188	0.0225	-3.03	1
50	-0.27	0.17	10.15	4.90	1.13	-0.34	7.99	4.01	0.0222	0.0220	-0.62	3
51	-0.49	0.48	10.47	5.49	0.83	0.02	7.99	4.28	0.0007	-0.0006	11.72	5
52	-0.50	0.22	8.36	4.76	0.42	0.18	6.37	3.79	-0.0093	-0.0043	11.67	21
53	-0.71	0.19	4.51	2.86	0.48	-0.17	1.88	1.62	-0.0066	-0.0106	11.69	6
54	0.99	-0.76	-3.93	-1.88	2.77	0.80	-5.23	-1.26	-0.0079	-0.0063	7.24	11
55	0.60	-1.54	-2.39	-1.90	2.38	-1.55	-5.16	-2.55	-0.0174	-0.0178	-11.69	30
56	-2.35	-0.75	-4.11	-3.96	-1.64	-0.88	-7.19	-5.29	0.0023	0.0028	-11.68	20
57	-2.49	-0.40	1.39	-1.09	-1.91	-0.89	0.94	-1.49	0.0152	0.0184	-11.66	16
58	-2.07	-0.40	-4.76	-3.45	-1.18	-0.88	-5.99	-3.94	-0.0164	-0.0212	3.91	13
59	-0.06	-1.05	-5.12	-3.00	1.44	-1.40	-8.62	-4.40	-0.0213	-0.0238	-11.70	16

60	-0.26	-0.36	0.01	-0.85	1.29	-0.74	0.05	-0.31	-0.0018	-0.0034	-11.68	7
61	0.16	-1.56	-3.92	-3.45	1.46	-1.63	-7.08	-4.94	-0.0098	-0.0132	-11.68	21
62	-1.15	-0.35	-4.19	-2.97	0.10	-1.01	-5.74	-3.55	-0.0188	-0.0216	-11.68	11
63	-0.98	-0.03	-4.63	-2.32	0.36	-0.66	-5.46	-2.44	-0.0222	-0.0238	-9.54	5
64	-0.84	0.11	-4.94	-2.41	0.41	-0.46	-5.72	-2.57	-0.0216	-0.0223	-2.42	3
65	-0.43	-0.33	-3.51	-2.07	1.03	-0.82	-4.91	-2.37	-0.0182	-0.0172	-8.20	6
66	-0.80	-0.65	-4.24	-2.87	0.34	-0.88	-6.00	-3.18	-0.0210	-0.0235	-9.01	12
67	-2.07	-0.84	-2.77	-3.45	-1.46	-1.04	-6.10	-4.87	-0.0064	-0.0102	-11.69	16
68	-3.01	-0.75	-2.74	-3.66	-2.59	-1.10	-5.19	-4.88	-0.0042	-0.0098	4.24	14
69	-3.81	0.38	-4.44	-4.05	-3.69	-0.38	-5.84	-5.01	-0.0104	-0.0121	3.64	4
70	-3.93	-0.08	1.55	-1.55	-3.62	-0.54	0.76	-1.92	0.0052	0.0104	11.67	9
71	-3.68	-1.15	-2.51	-4.39	-3.45	-1.42	-6.18	-6.39	-0.0033	-0.0054	-4.24	13
72	-2.79	-1.09	-3.66	-4.21	-2.37	-1.23	-5.22	-4.94	-0.0109	-0.0152	-11.70	19
73	-2.47	-0.40	-3.94	-3.76	-1.84	-0.84	-5.01	-4.12	-0.0204	-0.0232	11.41	4
74	-2.16	-0.45	-2.43	-2.98	-1.38	-0.87	-4.95	-3.97	-0.0219	-0.0225	1.89	6
75	0.12	-0.27	-3.97	-2.22	1.52	-0.69	-5.40	-2.28	-0.0162	-0.0174	-10.67	2
76	0.66	0.43	-5.32	-1.03	2.37	0.12	-6.16	-0.92	-0.0088	-0.0093	11.67	2
77	0.96	0.33	-5.81	-0.96	2.65	0.11	-6.50	-0.77	-0.0106	-0.0097	7.01	4
78	1.46	-0.14	-4.60	-1.10	3.32	-0.18	-5.55	-0.76	-0.0077	-0.0083	8.34	6
79	1.76	-0.80	-3.73	-1.18	3.74	-0.85	-5.14	-1.07	-0.0135	-0.0103	-11.68	7
80	2.25	-0.68	4.44	2.45	3.41	-0.24	2.10	1.68	0.0187	0.0180	11.67	6
81	2.40	-0.22	10.00	6.32	4.26	0.06	5.68	4.98	0.0113	0.0106	10.09	4
82	1.86	-0.22	7.84	5.37	3.39	0.34	4.50	4.37	0.0155	0.0158	-11.66	12
83	1.85	-1.04	7.74	4.76	3.89	-0.72	4.14	3.49	0.0201	0.0202	11.69	14
84	2.32	-1.27	6.46	3.93	3.77	-1.38	2.99	2.55	0.0196	0.0204	1.36	11
85	1.32	-1.46	7.70	3.74	2.73	-1.08	3.62	2.12	0.0192	0.0189	-2.79	8
86	1.13	-1.09	8.86	4.57	2.53	-0.61	4.08	2.95	0.0191	0.0193	-0.46	3
87	0.98	-0.52	3.96	2.38	2.34	-0.47	-0.17	1.08	0.0218	0.0231	11.71	4
88	-1.12	0.40	-4.66	-2.71	-0.10	-0.28	-5.73	-3.18	-0.0157	-0.0148	-10.92	4
89	-1.93	0.36	-5.17	-3.73	-1.21	-0.07	-5.58	-3.96	-0.0196	-0.0160	-7.40	10
90	-2.70	-0.02	-4.46	-3.93	-2.24	-0.31	-5.68	-4.60	0.0163	0.0231	-1.36	12
91	-4.43	-0.98	-3.62	-5.26	-4.48	-1.03	-7.66	-7.77	-0.0028	-0.0018	-11.68	23
92	-4.68	0.41	-3.69	-4.32	-4.99	-0.14	-4.98	-5.45	-0.0044	-0.0044	9.42	13
93	-2.23	-1.58	1.05	-2.10	-1.61	-1.55	-2.23	-4.04	0.0222	0.0237	-11.68	15
94	-0.12	-2.58	6.68	1.53	1.11	-2.44	3.64	0.23	0.0221	0.0221	-11.69	9
95	-0.43	-2.70	6.68	1.17	1.05	-2.98	2.97	-0.52	0.0217	0.0236	11.69	22
96	-0.60	-1.95	7.81	2.32	0.66	-2.07	3.94	0.44	0.0223	0.0232	-11.69	11
97	-1.47	-2.77	3.94	-0.33	-0.68	-3.02	-0.51	-2.80	-0.0152	-0.0181	11.77	82
98	-3.81	-2.75	-2.05	-5.50	-3.64	-3.69	-4.39	-6.94	0.0042	0.0031	-11.73	74
99	-3.71	-1.63	-0.69	-4.69	-3.34	-1.88	-0.70	-4.72	0.0086	0.0100	-11.65	10
100	-3.15	-0.96	-6.07	-6.50	-2.65	-1.45	-8.64	-7.82	-0.0066	-0.0074	-11.69	14
101	-3.02	-1.68	-5.04	-6.38	-2.69	-1.91	-9.23	-8.62	0.0026	0.0028	-11.66	19
102	-2.81	-0.68	-5.71	-5.41	-2.43	-1.05	-7.80	-6.26	-0.0012	-0.0018	-11.68	9
103	-3.02	0.29	-5.48	-4.07	-2.85	-0.26	-6.75	-4.86	-0.0005	-0.0013	-11.69	7
104	-2.69	-0.01	-6.06	-4.32	-2.37	-0.52	-7.48	-5.28	-0.0007	-0.0037	-11.66	6
105	1.24	-0.90	-6.19	-3.12	3.17	-1.03	-6.76	-2.31	-0.0069	-0.0093	-11.69	2
106	1.69	-1.43	-5.24	-2.75	3.79	-1.24	-5.76	-1.69	-0.0037	-0.0066	-11.68	6
107	1.76	-3.76	-4.52	-4.07	3.95	-4.04	-7.82	-5.24	0.0052	0.0116	-11.68	22
108	1.95	-2.45	-1.18	-1.82	4.25	-2.49	-0.21	-0.09	0.0166	0.0171	-11.67	12
109	1.74	-1.46	-6.14	-2.88	3.82	-1.37	-6.65	-2.08	-0.0049	-0.0064	-11.68	6
110	2.11	-2.37	-5.43	-2.77	4.30	-2.33	-6.90	-2.43	-0.0039	-0.0018	-11.68	12
111	-0.39	-1.76	-0.29	-2.16	1.00	-1.61	-0.33	-1.56	0.0213	0.0220	-11.65	13
112	-2.54	-0.28	-5.48	-4.13	-2.03	-0.47	-6.87	-4.63	-0.0017	0.0004	-10.96	10
113	-2.27	-0.22	-1.01	-2.11	-1.67	-0.30	-0.18	-1.34	0.0201	0.0235	-11.67	5
114	-0.86	-0.21	-6.11	-3.71	0.14	-0.30	-6.33	-3.28	-0.0196	-0.0200	-1.97	6
115	0.52	-2.46	-6.16	-4.88	1.82	-2.61	-8.43	-6.00	0.0051	0.0100	-11.67	21
116	0.89	-2.16	-2.64	-3.53	2.72	-2.17	-0.49	-1.33	0.0200	0.0201	-11.66	5
117	1.50	-2.31	-7.48	-4.21	3.56	-1.80	-6.96	-2.86	-0.0001	-0.0001	-11.67	2
118	1.65	-2.52	-3.92	-2.78	3.49	-2.07	-5.66	-2.50	-0.0050	-0.0059	-11.70	13
119	-1.87	-1.17	-0.20	-2.67	-1.16	-1.21	-0.30	-2.53	0.0224	0.0232	-11.65	14
120	-1.29	-1.04	-7.62	-5.37	-0.33	-0.96	-8.36	-5.23	0.0057	0.0039	-11.68	12
121	-0.36	-1.36	-6.19	-4.61	1.00	-1.37	-7.67	-4.60	0.0108	0.0078	-11.67	12
122	-1.82	-1.54	-5.14	-4.89	-0.83	-1.64	-6.56	-5.21	-0.0088	-0.0096	-11.68	15
123	-3.42	-1.24	-0.82	-3.36	-3.41	-1.52	-0.69	-3.30	0.0080	0.0063	-11.69	21
124	-3.10	-0.95	-4.91	-5.27	-2.81	-1.03	-5.97	-5.75	-0.0051	-0.0061	-11.68	17
125	-3.28	-0.73	-5.12	-5.24	-3.05	-0.78	-6.01	-5.30	-0.0059	-0.0090	-4.92	6
126	-4.23	-0.51	-5.67	-5.40	-4.56	-0.48	-7.32	-6.50	0.0046	0.0067	-11.66	10
127	-4.17	-0.74	-6.09	-6.25	-4.20	-0.77	-8.41	-7.27	0.0049	0.0058	-11.66	11
128	-3.06	0.13	-5.75	-4.68	-2.83	-0.09	-6.41	-4.77	-0.0017	-0.0012	-11.66	5
129	-1.82	0.47	-6.24	-3.95	-1.28	0.39	-6.15	-3.31	-0.0056	-0.0025	11.68	4
130	-0.45	-1.07	-5.52	-4.09	0.57	-1.01	-7.40	-4.61	-0.0154	-0.0181	0.68	8

131	-0.07	-1.48	-3.99	-3.61	1.19	-1.36	-5.94	-3.77	0.0025	0.0009	-11.68	6
132	-0.14	-0.81	-0.68	-1.69	0.95	-0.74	0.65	-0.16	0.0146	0.0153	-11.66	4
133	-2.17	-1.07	-4.39	-4.21	-1.73	-1.06	-6.02	-5.14	-0.0007	0.0005	-11.66	15
134	-3.00	-0.23	-2.68	-3.19	-2.67	-0.56	-4.15	-4.08	-0.0001	0.0029	-11.68	14
135	-1.62	-0.06	-5.41	-3.86	-0.78	-0.19	-6.16	-3.71	-0.0034	0.0006	-11.68	9
136	-5.04	2.35	-0.32	-0.92	-6.43	1.95	-1.05	-2.03	0.0114	0.0131	6.22	12
137	-2.51	-0.62	1.58	0.23	-2.28	-0.69	-0.97	-1.57	0.0099	0.0114	8.91	16
138	-2.82	-2.58	-5.56	-6.62	-2.41	-2.99	-8.39	-8.40	0.0072	0.0079	-11.65	28
139	-2.71	-1.23	-5.67	-5.37	-2.30	-1.35	-6.92	-5.75	0.0031	0.0041	-11.69	7
140	-4.35	0.09	-5.98	-5.61	-4.51	-0.38	-6.25	-5.99	-0.0043	-0.0027	-11.68	7
141	-3.81	0.25	-4.94	-4.46	-4.08	-0.26	-5.94	-5.37	0.0076	0.0120	11.66	4
142	-2.52	-0.40	-5.09	-4.24	-1.95	-0.51	-5.64	-4.10	-0.0024	0.0008	-11.66	5
143	-0.92	0.03	1.75	0.80	-0.20	0.14	1.09	0.84	0.0221	0.0231	-11.62	8
144	-1.02	0.32	4.79	3.94	-0.35	0.24	2.48	2.58	0.0213	0.0207	-11.65	29
145	-1.46	-3.16	3.90	-0.81	-0.77	-3.32	-0.05	-3.42	0.0111	0.0121	-11.68	93
146	-1.21	-3.21	3.69	-0.81	-0.35	-3.33	0.26	-2.86	0.0092	0.0096	-11.68	28
147	-3.32	-1.80	5.28	0.57	-3.28	-1.70	1.07	-2.24	0.0149	0.0187	-11.64	15
148	-3.76	-0.74	7.28	1.70	-4.15	-0.67	4.74	0.03	0.0168	0.0210	-11.69	8
149	-3.21	-0.86	6.64	1.53	-3.26	-0.90	3.62	-0.55	0.0183	0.0214	-11.66	9
150	-2.72	-0.98	6.58	1.91	-2.62	-0.98	4.07	-0.01	0.0179	0.0223	-11.66	24
151	-2.03	-1.75	3.07	-0.30	-1.51	-1.71	1.09	-1.37	0.0204	0.0227	-11.66	22
152	-1.08	-1.41	-6.91	-5.66	-0.19	-1.69	-8.39	-6.08	0.0058	0.0046	-11.68	10
153	-1.86	-1.44	-6.49	-5.47	-1.17	-1.31	-7.57	-5.55	0.0101	0.0116	-11.66	8
154	-3.38	-0.26	-0.77	-2.82	-3.32	-0.42	0.68	-1.99	0.0209	0.0238	-11.67	6
155	-3.62	-0.67	0.00	-2.73	-3.73	-0.56	0.23	-2.45	0.0179	0.0231	-11.66	11
156	-2.26	-0.38	-5.63	-4.32	-1.81	-0.48	-5.80	-4.16	0.0018	0.0077	-11.70	12
157	-1.90	-0.73	-7.06	-5.04	-1.59	-0.64	-9.00	-6.02	0.0171	0.0230	-11.67	24
158	-0.98	-0.74	-5.81	-4.33	-0.10	-0.71	-7.09	-4.55	0.0176	0.0194	-11.67	15
159	-2.69	-0.84	-3.29	-3.72	-2.41	-0.90	-4.21	-4.25	0.0056	0.0086	-2.03	11
160	-2.91	-1.66	0.72	-2.93	-3.08	-1.70	-0.80	-3.83	0.0066	0.0126	0.02	64
161	-4.69	-0.43	-4.07	-5.43	-4.97	-1.03	-4.21	-5.83	0.0112	0.0170	-11.66	5
162	-4.38	-1.39	-5.93	-6.74	-5.06	-1.53	-8.63	-8.82	0.0011	0.0034	-11.68	21
163	-4.69	0.01	-0.90	-2.81	-5.10	-0.45	-0.51	-2.99	0.0174	0.0218	-11.62	25
164	-4.38	-0.43	-7.07	-6.87	-4.68	-0.72	-7.36	-7.13	0.0048	0.0088	-11.69	15
165	-2.52	-1.21	-5.44	-4.91	-2.45	-1.00	-7.10	-5.68	-0.0006	0.0027	-11.66	10
166	-2.31	-0.35	-0.06	-1.74	-2.06	-0.19	0.54	-1.01	0.0179	0.0171	0.52	29
167	-1.81	-0.79	-0.96	-2.36	-1.10	-0.94	-0.59	-1.98	0.0221	0.0238	-11.63	23
168	-1.67	-0.36	-5.14	-4.43	-1.07	-0.67	-5.48	-4.37	-0.0071	0.0010	-11.67	5
169	-3.89	0.40	-4.60	-4.69	-4.02	0.05	-4.54	-4.87	-0.0027	0.0046	-1.94	6
170	-5.24	0.43	-4.45	-5.29	-5.85	-0.11	-5.26	-6.30	-0.0019	0.0012	11.68	10
171	-4.89	0.91	-5.90	-5.23	-5.16	0.19	-6.29	-5.97	0.0009	0.0062	-8.37	6
172	-2.71	-0.10	-6.92	-5.44	-2.61	-0.11	-7.02	-5.41	-0.0060	0.0011	-8.77	6
173	-2.05	-0.55	-4.16	-4.13	-1.75	-0.55	-4.62	-3.91	-0.0131	-0.0091	-11.67	6
174	-1.61	-0.32	-1.05	-2.05	-1.06	-0.21	0.45	-0.66	0.0106	0.0108	11.67	11
175	-1.97	-0.34	-4.75	-4.04	-1.52	-0.53	-6.35	-4.77	-0.0223	-0.0237	11.71	27
176	-2.42	-1.01	-5.08	-5.02	-2.09	-1.40	-6.85	-5.85	0.0010	-0.0019	-11.67	15
177	-2.92	0.10	-6.20	-4.79	-2.61	-0.32	-5.89	-4.38	-0.0156	-0.0191	6.89	6
178	-2.44	-1.80	-0.79	-3.61	-2.54	-1.61	-2.10	-4.56	0.0065	0.0101	-11.65	40
179	-2.75	-1.64	-4.53	-5.53	-2.24	-1.74	-6.37	-6.63	0.0086	0.0103	-11.65	18
180	-2.42	-1.66	1.89	-0.43	-2.46	-1.73	0.72	-1.72	0.0222	0.0237	-11.66	10
181	-1.66	-1.04	10.18	4.52	-1.72	-1.10	7.33	2.03	0.0189	0.0228	-11.67	8
182	-1.47	-0.22	4.16	1.68	-1.40	-0.54	2.30	0.44	0.0123	0.0125	11.68	4
183	-2.95	0.26	-4.93	-3.78	-2.85	0.03	-5.58	-4.07	0.0155	0.0143	-11.66	7
184	-3.21	0.28	-6.50	-4.81	-3.18	0.00	-5.77	-4.25	-0.0168	-0.0131	11.68	4
185	-2.62	-0.21	-4.96	-3.86	-2.48	-0.15	-5.60	-3.99	0.0091	0.0191	-2.23	8
186	-1.25	-0.18	-5.13	-3.78	-0.60	-0.18	-4.99	-3.08	-0.0112	-0.0014	-11.64	8
187	-0.10	-1.42	-6.10	-4.55	0.76	-1.09	-7.91	-4.71	-0.0069	0.0017	-11.65	9
188	0.37	-0.76	-5.21	-3.41	1.64	-0.72	-5.70	-2.81	-0.0116	-0.0098	-11.68	5
189	-2.76	-0.27	-5.57	-4.65	-2.49	-0.37	-6.15	-4.71	0.0125	0.0194	-11.65	5
190	-3.19	-0.08	-5.52	-5.30	-3.15	-0.38	-6.09	-5.32	-0.0066	-0.0038	-11.67	6
191	-4.51	0.52	-3.93	-4.36	-4.90	0.11	-5.03	-5.07	-0.0033	0.0004	2.38	6
192	-4.08	0.02	-6.18	-5.06	-4.51	0.07	-7.11	-5.82	0.0010	0.0044	-11.66	20
193	-2.42	-0.17	-4.99	-4.03	-2.69	-0.21	-5.93	-4.45	-0.0022	0.0023	-11.66	34
194	-3.58	0.26	-6.31	-5.38	-3.47	-0.29	-7.09	-5.88	0.0207	0.0236	-11.66	9
195	-2.23	-0.53	-1.09	-2.23	-2.07	-0.76	-0.41	-1.96	0.0035	0.0087	-11.64	42
196	-1.89	-1.42	-5.05	-5.14	-1.59	-1.55	-7.54	-6.28	-0.0223	-0.0238	11.70	51
197	-2.08	-2.72	-2.08	-4.82	-1.91	-2.82	-6.21	-7.14	-0.0198	-0.0218	11.81	164
198	-3.81	-2.76	-2.87	-5.20	-3.85	-3.82	-3.39	-6.14	0.0169	0.0212	-11.70	50
199	-6.54	-0.06	-6.78	-6.84	-7.54	-0.81	-6.29	-7.39	0.0038	0.0053	-11.67	8
200	-6.10	-0.24	-6.24	-7.03	-6.88	-0.80	-7.02	-7.98	0.0030	0.0042	-11.67	12
201	-5.84	0.29	-5.08	-5.51	-6.38	-0.35	-5.39	-6.22	0.0020	0.0025	-11.65	14

202	-5.26	-2.21	-5.04	-7.36	-6.15	-2.33	-8.08	-9.96	0.0010	0.0019	-11.67	36
203	-2.62	-2.05	-6.55	-6.93	-2.00	-2.39	-6.99	-6.99	0.0087	0.0113	-11.67	7
204	-0.99	-3.02	-6.55	-6.94	-0.29	-3.06	-9.49	-8.39	-0.0082	-0.0079	-11.70	12
205	-2.76	-1.89	-3.66	-5.82	-2.21	-2.19	-5.60	-6.56	-0.0102	-0.0123	-3.11	23
206	-2.39	-1.53	-6.26	-6.40	-1.82	-1.93	-6.86	-6.68	0.0014	-0.0004	-11.69	5
207	-2.05	-1.06	-6.37	-5.58	-1.26	-1.34	-6.09	-5.14	0.0025	0.0039	-11.68	5
208	-2.55	-1.93	-5.77	-6.70	-2.33	-1.79	-7.92	-7.66	0.0025	0.0043	-11.67	19
209	-4.13	-0.46	-1.70	-3.92	-4.03	-1.08	0.12	-3.11	0.0201	0.0232	-11.65	7
210	0.82	-2.86	-5.96	-4.98	2.07	-2.89	-7.65	-5.56	-0.0198	-0.0226	-11.68	32
211	1.00	-3.27	-3.89	-4.46	2.35	-3.56	-6.15	-5.36	0.0224	0.0220	-11.66	27
212	-1.27	-1.35	-4.80	-4.99	-0.20	-1.84	-5.06	-4.85	-0.0098	-0.0238	-11.70	8
213	-1.80	-1.85	-6.16	-5.94	-1.42	-1.75	-8.38	-6.90	0.0119	0.0138	-11.68	21
214	-1.99	-1.33	-6.62	-5.86	-1.28	-1.66	-8.27	-6.61	-0.0002	-0.0001	-11.68	12
215	-1.28	-1.59	-5.97	-5.71	-0.21	-1.54	-7.51	-6.12	0.0061	0.0050	-11.69	10
216	-0.12	-1.40	-5.83	-4.44	1.34	-1.66	-6.93	-4.52	-0.0028	-0.0074	-11.67	9
217	1.56	-3.19	-6.01	-4.84	3.47	-3.30	-8.77	-5.44	0.0029	0.0097	-11.68	17
218	0.07	-2.86	-5.64	-5.29	1.27	-3.02	-7.49	-5.71	-0.0134	-0.0192	-11.58	25
219	-2.39	-2.17	-5.54	-6.61	-1.78	-2.43	-6.97	-7.44	0.0031	0.0009	-11.67	16
220	-2.14	-1.64	-6.37	-5.95	-1.61	-1.67	-7.36	-6.42	-0.0040	-0.0076	-11.68	7
221	-3.34	-1.07	-5.38	-6.01	-2.99	-1.06	-6.66	-6.31	-0.0003	0.0013	-11.68	6
222	-2.72	-0.59	-5.69	-5.31	-2.18	-0.79	-6.23	-5.25	-0.0003	0.0017	-11.68	5
223	-1.69	-2.02	-4.54	-5.36	-1.07	-2.17	-6.46	-6.51	-0.0009	0.0031	-11.65	25
224	-0.81	-3.81	-4.64	-6.59	0.19	-4.16	-9.72	-9.39	0.0038	0.0053	-11.65	47
225	-0.93	-4.64	-2.84	-6.12	-0.09	-4.18	-7.66	-8.90	0.0014	0.0028	-11.63	123
226	-3.93	-1.24	-3.94	-5.18	-3.90	-1.73	-4.08	-5.37	0.0061	0.0073	-11.69	19
227	-4.19	0.18	-2.10	-4.05	-4.32	-0.65	-0.15	-3.47	0.0114	0.0153	-11.67	12
228	-5.63	0.21	-6.58	-6.44	-6.20	-0.50	-8.12	-7.59	0.0033	0.0049	-11.66	8
229	-5.55	0.36	-6.65	-6.42	-6.18	-0.29	-7.78	-7.61	-0.0006	0.0015	-11.68	7
230	-4.55	-0.10	-0.07	-2.02	-5.08	-0.58	-1.18	-3.24	0.0214	0.0237	-11.66	6
231	-2.69	-0.21	13.07	5.53	-2.62	-0.47	8.94	3.29	0.0197	0.0232	-11.67	3
232	-2.36	-0.12	13.37	5.87	-2.21	-0.45	9.70	3.70	0.0215	0.0239	-3.69	4
233	-2.06	-0.09	12.50	5.95	-1.83	-0.24	8.83	4.04	0.0222	0.0236	1.01	4
234	-2.33	-1.85	3.84	0.01	-2.02	-1.98	1.52	-1.65	0.0042	0.0032	-11.69	10
235	-2.93	0.00	-6.99	-4.99	-2.52	-0.48	-6.71	-4.98	0.0028	0.0057	-11.66	2
236	-2.55	-0.17	-1.53	-2.75	-1.89	-0.77	-0.41	-2.08	0.0177	0.0223	-11.66	7
237	-1.23	-0.43	-6.01	-4.18	-0.33	-0.68	-5.77	-3.99	0.0050	0.0102	-11.67	8
238	-2.44	-0.51	-6.07	-4.80	-1.90	-0.80	-5.27	-4.32	0.0031	0.0018	-11.66	3
239	-2.05	-1.13	-5.91	-4.93	-1.71	-1.04	-7.14	-5.37	0.0081	0.0115	-11.67	5
240	-3.02	-0.01	-5.24	-4.18	-2.80	-0.31	-5.75	-4.47	0.0001	0.0024	4.71	7
241	-2.60	-0.85	-4.90	-4.89	-2.34	-0.97	-7.12	-6.07	-0.0059	-0.0001	11.69	27
242	-3.60	-1.77	-5.39	-6.82	-3.44	-1.74	-9.11	-8.85	0.0015	0.0019	-11.66	35
243	-3.36	-0.77	-5.76	-5.53	-3.05	-1.01	-8.07	-6.77	0.0009	0.0019	-11.68	12
244	-2.48	-1.10	-7.40	-6.08	-1.97	-1.13	-9.45	-7.17	0.0038	0.0060	-11.67	14
245	-0.97	-2.07	-6.19	-5.12	0.25	-1.95	-8.71	-6.18	-0.0208	-0.0209	-11.69	16
246	-0.06	-3.06	-6.08	-5.72	1.09	-3.07	-10.04	-7.59	0.0090	0.0104	-11.66	23
247	-1.83	-0.41	-5.03	-4.32	-0.96	-1.03	-5.38	-4.62	-0.0139	-0.0161	-11.67	7
248	-4.17	-0.92	-5.79	-6.27	-4.32	-1.19	-7.19	-7.45	0.0024	0.0051	5.82	18
249	-3.06	-2.38	0.28	-2.10	-2.91	-2.13	-0.93	-2.96	0.0168	0.0174	-11.66	7
250	-3.47	0.51	10.18	4.18	-3.64	0.26	5.94	1.61	0.0221	0.0238	-11.64	12
251	-2.66	-0.93	6.04	2.53	-2.40	-1.17	3.38	0.62	0.0173	0.0197	-11.65	15
252	-2.02	-1.46	1.79	-0.81	-1.56	-1.79	-1.32	-2.70	-0.0002	-0.0027	11.71	17
253	-2.36	-0.29	-6.75	-4.78	-1.87	-0.60	-6.91	-4.93	-0.0208	-0.0231	-11.70	5
254	-1.94	-0.35	-6.06	-4.17	-1.36	-0.43	-6.49	-4.27	-0.0119	-0.0128	-11.52	4
255	-1.98	0.15	-5.64	-3.53	-1.26	-0.19	-5.98	-3.64	-0.0207	-0.0227	-11.67	4
256	-2.50	-1.13	-5.48	-5.81	-2.06	-1.36	-8.99	-7.97	-0.0058	-0.0038	-9.89	21
257	-5.15	-0.24	-6.14	-6.28	-5.49	-0.71	-7.71	-7.64	0.0053	0.0059	-11.65	10
258	-4.05	-0.14	-6.52	-5.44	-4.15	-0.58	-7.77	-6.49	0.0032	0.0054	-11.69	4
259	-2.61	0.00	-5.54	-4.00	-2.07	-0.19	-5.73	-4.03	-0.0198	-0.0173	0.59	12
260	-1.89	-1.51	-4.22	-4.76	-1.02	-1.82	-7.89	-6.47	-0.0186	-0.0215	-5.88	29
261	-2.86	-1.18	-3.04	-4.64	-2.31	-1.74	-6.02	-5.95	-0.0172	-0.0199	3.07	56
262	-2.81	-2.68	-4.46	-6.33	-2.41	-3.57	-5.15	-7.07	0.0059	0.0065	-11.71	70
263	-2.59	-2.06	-5.42	-6.29	-2.14	-2.47	-7.76	-7.95	0.0022	0.0022	-11.68	30
264	-2.88	-1.34	-6.28	-6.39	-2.31	-1.84	-8.14	-7.34	0.0032	0.0026	-11.69	12
265	-4.42	-0.23	-6.44	-6.03	-4.65	-0.76	-8.71	-7.58	0.0020	0.0026	-11.66	9
266	-4.03	-0.42	-6.75	-6.13	-4.19	-0.68	-7.37	-6.81	0.0021	0.0020	-11.66	6
267	-3.21	-0.18	-6.30	-5.11	-3.03	-0.77	-7.27	-5.92	0.0062	0.0075	-11.65	7
268	-1.07	-1.07	-4.59	-4.27	-0.04	-1.36	-5.48	-4.58	-0.0218	-0.0231	1.20	12
269	-1.27	-2.53	-6.49	-6.52	-0.09	-2.43	-9.38	-7.60	-0.0050	-0.0051	-11.67	19
270	-3.21	-1.88	-4.70	-6.18	-2.83	-1.99	-8.42	-8.26	0.0032	0.0037	-11.68	24
271	-2.97	-0.61	-6.61	-5.66	-2.51	-1.00	-8.51	-6.69	0.0054	0.0067	-11.69	11
272	-3.34	-0.88	-6.37	-5.93	-2.94	-1.14	-8.94	-7.34	0.0002	0.0024	-11.67	12

273	-4.23	-0.29	-5.57	-5.99	-4.14	-0.84	-7.01	-6.88	-0.0017	-0.0018	-10.98	7
274	-3.61	-2.32	-4.69	-6.71	-3.60	-2.53	-9.82	-9.88	-0.0044	-0.0057	-11.68	51
275	-3.65	-0.83	-5.87	-5.60	-3.51	-1.29	-8.20	-6.93	0.0039	0.0054	-11.67	13
276	-3.36	-0.66	-5.80	-5.53	-3.14	-1.02	-7.41	-6.69	-0.0035	-0.0013	-11.69	10
277	-3.55	-0.48	0.62	-2.64	-3.81	-0.88	-1.57	-4.35	0.0041	0.0067	10.06	30
278	-3.98	-1.65	-4.27	-6.00	-4.16	-1.68	-9.46	-9.07	-0.0104	-0.0118	11.74	63
279	-5.41	-2.34	-1.38	-5.25	-5.89	-2.78	-7.44	-9.00	-0.0055	-0.0055	-11.69	116
280	-4.60	-0.56	-5.59	-5.71	-4.78	-1.54	-5.78	-6.43	0.0027	0.0035	-11.69	4
281	-4.10	-0.40	-6.99	-6.21	-4.20	-1.14	-7.99	-7.16	-0.0022	-0.0032	-11.68	4
282	-3.57	0.09	-5.48	-4.79	-3.39	-0.79	-5.53	-5.45	-0.0009	-0.0012	-11.66	2
283	-3.18	0.14	-4.49	-3.99	-2.79	-0.58	-4.99	-4.59	-0.0051	-0.0074	-11.71	4
284	-2.18	-0.86	-4.23	-4.24	-1.63	-1.12	-7.39	-5.65	0.0030	0.0052	-11.65	8
285	-1.34	-1.39	-5.90	-5.34	-0.33	-1.69	-8.72	-6.79	0.0011	0.0018	-11.67	15
286	-3.50	-0.44	-6.62	-5.54	-3.14	-0.88	-7.75	-6.34	0.0019	0.0023	-11.68	6
287	-2.89	-0.78	-0.56	-2.24	-2.45	-1.39	-1.31	-2.62	0.0112	0.0159	-11.66	36
288	-1.82	-2.98	1.14	-3.31	-1.22	-3.08	-2.15	-5.31	0.0015	0.0023	-11.68	45
289	-2.29	-0.78	-5.92	-5.12	-1.58	-1.43	-7.27	-5.84	-0.0099	-0.0157	-11.70	8
290	-2.02	-0.53	-5.20	-4.52	-1.17	-1.19	-6.69	-5.30	-0.0168	-0.0192	-11.70	10
291	-4.01	0.13	-5.90	-5.32	-3.96	-0.44	-7.48	-6.52	-0.0087	-0.0109	-11.66	11
292	-4.91	0.51	-5.97	-5.88	-5.20	-0.20	-7.87	-7.31	-0.0017	-0.0023	-11.68	9
293	-4.24	0.28	-7.57	-5.74	-4.35	-0.19	-8.65	-6.66	-0.0044	-0.0061	-11.68	9
294	-1.45	0.17	-1.60	-1.99	-0.60	-0.39	0.27	-0.92	0.0216	0.0237	-11.66	3
295	-0.38	0.13	-1.78	-1.73	0.84	-0.52	0.09	-0.66	-0.0095	-0.0105	-11.67	3
296	0.24	-0.80	-6.01	-4.09	1.77	-1.28	-8.09	-5.12	-0.0223	-0.0238	8.60	16
297	-3.05	-1.19	-5.18	-5.28	-2.75	-1.41	-7.36	-6.53	0.0038	0.0039	-11.66	15
298	-3.84	-0.42	-5.39	-5.23	-3.87	-0.81	-7.61	-6.84	-0.0018	-0.0028	-11.67	9
299	-4.16	0.13	-0.52	-2.78	-3.90	-0.50	-0.71	-3.34	0.0103	0.0146	-11.65	6
300	-3.26	-0.47	-5.65	-5.13	-2.90	-0.72	-8.10	-6.36	-0.0050	-0.0052	-11.68	8
301	-1.22	-0.36	4.43	1.17	-0.30	-0.63	1.38	0.39	-0.0201	-0.0232	-11.69	4
302	-3.07	0.08	7.47	2.96	-2.84	-0.04	4.80	1.37	0.0181	0.0210	8.86	20
303	-3.16	-2.29	4.37	-0.42	-2.71	-2.50	-0.04	-3.23	0.0062	0.0081	-11.72	34
304	-2.78	-0.49	0.37	-1.88	-2.34	-0.99	-1.56	-3.08	-0.0124	-0.0169	9.35	15

APPENDIX D. LATE CALIBRATION ORBITAL RESULTS FOR ALL DATA

The columns of data below have the following format from left to right, where an orbit is defined only as a 6120second period:

1. Average decimal day of year 2000 of the field vector in this orbit.
2. Orbital average difference from zero of measured-minus-modeled field for all X (down) components in nT.
3. Orbital average difference from zero of measured-minus-modeled field for all Y (velocity) components in nT.
4. Orbital average difference from zero of measured-minus-modeled field for all Z (orbit normal) components in nT.
5. Orbital average magnitude of differences from zero of measured-minus-modeled field for all components in nT.
6. Number of vectors contributing to these averages.
7. Three hour Ap most closely corresponding to the value in column 1.

5.026771	40.45	72.09	158.55	193.71	4564	27
5.088889	49.79	70.05	177.58	215.78	6050	27
5.159711	43.39	65.31	174.48	206.03	6057	18
5.230544	34.39	73.70	172.22	201.38	6061	18
5.372234	29.53	78.99	179.29	212.70	6058	18
5.519537	31.96	65.18	163.79	190.78	5084	9
5.584676	33.09	64.03	182.23	211.25	6042	9
5.639711	40.00	53.12	200.21	222.21	3337	15
5.731215	36.88	61.94	167.59	200.20	5231	15
5.797245	33.07	55.62	176.60	200.59	6054	22
5.868090	32.10	56.61	173.64	201.25	6057	22
5.987998	51.76	66.83	200.07	233.62	2047	27
6.021910	34.00	43.82	28.71	73.20	3731	12
6.079167	41.29	49.70	28.90	80.31	6057	12
6.150012	39.73	52.34	32.22	83.05	6057	18
6.220810	33.21	66.77	27.84	89.81	6053	18
6.291678	31.62	40.68	14.99	59.67	6061	7
6.362488	25.76	47.21	28.15	70.07	6055	7
6.433333	26.99	51.43	28.21	75.08	6056	18
6.504132	30.34	59.41	38.76	89.46	6046	32
6.574965	36.29	73.99	73.54	128.51	6051	32
6.645822	35.38	90.39	79.52	143.07	6050	32
6.716690	33.15	56.46	66.37	108.71	6048	32
6.787535	34.14	50.95	43.89	91.27	6051	15
6.858356	30.72	51.58	39.38	85.80	6038	15
6.929190	36.10	47.37	46.34	89.81	6057	18
6.982292	43.72	46.45	33.26	81.71	3018	18
7.017037	27.16	53.49	27.97	76.70	2909	18
7.069433	40.52	65.66	43.09	101.16	6055	18
7.140289	35.96	63.67	37.99	93.67	6058	15
7.211100	33.02	50.12	21.57	71.94	6058	15
7.281956	31.12	43.82	16.70	63.68	6060	5
7.352801	25.92	45.56	22.14	65.58	6057	5
7.423611	26.82	46.06	27.59	71.55	6059	7
7.494444	31.06	49.25	24.91	73.74	6059	7
7.565266	33.81	48.80	20.98	72.69	6056	7
7.637292	31.27	49.08	27.87	74.17	5542	9
7.706944	34.78	49.22	33.36	80.36	6046	9
7.777755	32.22	46.39	36.64	78.20	6044	12
7.848634	31.46	56.52	36.62	86.04	6050	12
7.919491	32.63	41.96	37.06	76.27	6057	7
7.977431	35.07	53.62	28.25	79.39	3851	7

8.012153	34.60	43.11	101.41	129.63	2080	7
8.059711	36.67	65.99	152.11	184.67	6050	7
8.130556	35.22	53.63	152.50	176.95	6061	3
8.201366	32.38	45.46	150.48	171.17	6054	3
8.272199	30.22	49.38	154.46	175.42	6060	5
8.413889	24.67	46.99	157.97	175.88	6059	6
8.484722	30.64	58.44	154.80	181.72	6056	6
8.555532	34.66	58.91	161.54	188.53	6058	6
8.626412	34.75	62.10	168.30	195.30	6044	9
8.773160	30.50	48.08	151.43	173.82	5185	3
8.838912	28.50	44.68	157.54	177.41	6053	3
8.975081	38.87	51.22	163.37	185.95	4256	0
9.007303	41.10	35.15	49.27	81.85	1248	5
9.050058	37.36	52.60	60.00	98.18	6038	5
9.120833	44.12	51.07	57.43	100.57	6063	5
9.191725	36.80	48.51	56.33	92.62	6038	5
9.262477	35.28	44.21	57.36	88.61	6047	0
9.333391	28.24	44.73	58.76	88.06	6047	0
9.622569	33.94	55.20	58.53	98.17	5037	2
9.687500	29.72	49.71	64.51	98.54	6052	2
9.833519	27.71	45.72	58.82	89.19	5314	2
9.900046	32.71	44.02	67.12	97.50	6053	6
9.967731	35.78	46.54	64.96	97.30	5518	6
10.002442	42.79	60.41	55.34	98.06	414	5
10.040266	39.43	59.47	148.03	176.74	6048	5
10.116817	47.09	67.87	133.20	172.13	5022	5
10.181944	38.47	54.92	146.21	174.15	6059	7
10.252755	35.14	55.38	142.77	168.83	6061	3
10.323600	29.87	61.68	144.23	171.86	6062	3
10.394444	28.00	53.41	146.12	169.39	6059	3
10.465255	28.57	59.29	146.99	174.28	6055	3
10.536088	30.94	61.84	153.37	179.81	6048	4
10.606944	32.05	61.58	157.87	183.72	6055	4
10.677813	28.80	54.05	158.53	180.13	6052	6
10.964155	39.00	60.18	159.73	190.60	5534	15
10.997824	21.46	78.20	138.75	162.90	223	15
11.136644	27.96	89.04	9.56	93.83	27	9
11.172211	39.37	60.50	30.95	87.61	6060	9
11.243009	36.10	48.00	18.75	69.67	6051	9
11.313866	31.35	49.82	23.68	70.99	6060	6
11.384722	28.08	50.85	20.46	70.06	6059	9
11.455556	28.72	59.41	24.61	80.04	6060	9
11.527072	28.42	65.84	33.65	91.26	5848	22
11.597222	29.70	83.94	49.65	119.16	6049	22
11.668021	27.78	71.51	64.66	119.82	6030	22
11.738866	29.39	78.39	68.60	128.23	6034	22
11.809757	42.10	85.99	103.36	164.68	6048	56
11.880509	42.42	89.26	73.88	146.98	6036	56
11.951447	49.83	102.54	84.65	161.02	6040	56
11.993403	54.61	78.45	57.28	138.14	1124	56
12.028125	49.78	80.67	45.94	119.82	4799	22
12.091690	56.85	80.43	66.14	133.23	6049	22
12.162488	52.20	69.45	53.98	115.92	6058	15
12.233287	49.29	68.83	57.95	115.55	6053	15
12.304167	40.16	58.78	51.87	99.38	6051	12
12.375012	36.37	48.39	49.16	88.96	6061	7
12.445845	33.06	53.33	48.62	90.83	6062	7
12.516644	34.82	58.86	52.31	98.45	6052	4
12.663171	25.36	43.17	53.23	84.29	4480	7
12.729178	31.84	55.70	64.05	107.08	6049	7
12.800035	34.06	53.55	68.72	109.28	6041	9
12.871863	33.59	54.09	63.25	104.73	5817	9
12.941690	41.79	55.80	60.53	106.37	6057	7
12.988542	56.66	53.16	76.63	126.79	1958	7
13.023310	40.90	64.97	30.03	92.40	3970	7
13.081933	51.28	55.24	34.65	94.23	6057	7
13.152778	51.36	52.30	33.13	91.66	6066	9
13.223588	44.19	58.59	20.70	85.90	6054	9
13.294433	38.50	57.98	20.51	81.43	6061	9
13.365278	33.81	52.51	31.90	81.47	6061	9
13.436111	34.43	54.21	26.59	79.78	6059	15

13.506296	31.63	52.10	33.46	82.34	5854	9
13.577975	31.31	57.49	29.74	83.60	5996	9
13.648588	29.99	60.05	26.07	82.24	6002	12
13.719664	28.37	52.06	31.70	76.66	6001	12
13.790289	31.21	50.16	32.68	78.04	6052	4
13.861111	28.48	45.47	34.56	76.44	6043	4
13.922014	37.37	53.60	47.24	95.85	4355	6
13.985567	46.21	45.33	27.99	81.89	2463	6
14.018449	30.17	81.06	55.52	114.56	3140	15
14.072234	39.56	52.96	66.32	106.96	6054	15
14.143056	36.22	55.68	63.40	103.10	6064	9
14.213877	33.97	50.33	58.70	95.77	6053	9
14.284722	31.65	42.00	58.46	87.60	6064	4
14.355556	25.60	45.69	61.38	88.80	6060	4
14.426389	23.45	49.95	60.75	91.90	6060	3
14.497222	28.47	57.52	65.20	103.83	6058	3
14.568009	32.13	61.21	67.91	109.46	6047	6
14.855405	27.32	47.83	70.34	103.13	5374	9
14.891273	27.82	47.69	93.88	120.62	758	6
15.035949	16.83	87.98	67.43	113.47	155	7
15.133310	36.64	58.81	73.09	113.81	6053	7
15.204167	34.05	60.96	73.69	112.25	6061	7
15.275012	31.29	50.40	69.29	101.89	6055	5
15.345845	25.63	40.87	69.71	93.11	6057	5
15.416667	24.19	39.32	71.92	93.90	6057	3
15.487500	27.36	57.77	75.12	109.85	6058	3
15.558310	32.15	53.37	74.87	108.96	6055	7
15.629155	30.97	52.65	83.92	114.89	6057	5
15.670764	26.10	45.01	117.19	134.68	1048	5
16.008692	29.22	48.22	138.65	161.25	1486	5
16.052778	37.86	72.20	165.17	203.82	6053	5
16.123611	41.49	59.12	171.14	199.89	6055	5
16.265289	33.22	51.93	160.45	182.75	6063	5
16.336111	26.23	59.18	162.47	187.40	6054	5
16.406944	25.99	48.72	164.95	182.60	6054	5
16.624954	33.24	55.82	168.19	190.83	5104	6
16.765881	27.87	50.75	169.63	190.21	5242	6
16.831932	27.10	44.64	177.92	195.89	6046	6
16.902788	29.92	50.64	181.48	203.05	6056	7
16.969120	35.59	64.89	181.42	210.24	5277	7
17.003832	40.30	55.65	56.95	96.67	651	5
17.113876	42.10	57.57	94.13	130.46	6055	5
17.184711	38.73	50.90	96.07	127.23	6057	2
17.255545	35.36	59.06	96.04	130.73	6063	4
17.397234	26.54	48.97	94.80	120.57	6053	2
17.468067	27.61	54.06	94.96	124.09	6052	2
17.538866	30.98	53.69	100.05	128.77	6056	3
17.609699	31.64	55.93	101.56	131.54	6046	3
17.680567	29.37	49.99	98.68	126.40	6056	2
17.751411	27.45	46.65	99.26	123.74	6051	3
17.822256	26.72	44.90	93.49	117.39	6053	3
17.893103	28.41	43.62	101.57	124.62	6058	0
17.963900	34.64	49.09	90.74	119.59	6050	0
17.999641	21.10	76.81	29.61	85.47	59	0
18.005360	16.25	80.64	68.05	108.33	169	2
18.104155	46.30	60.17	88.12	131.01	6055	2
18.174988	42.49	59.55	113.03	147.33	6059	2
18.245810	40.15	64.44	97.38	138.51	6059	2
18.316668	32.54	57.36	99.19	132.52	6059	3
18.458309	30.90	56.11	101.18	132.32	6053	3
18.522280	32.69	58.08	96.08	128.53	4873	4
18.605591	32.03	63.14	105.78	138.75	5094	4
18.670834	29.62	52.78	110.11	138.73	6054	5
18.741690	25.25	44.88	108.01	131.13	6052	5
18.812511	28.90	43.27	104.18	129.92	6050	3
18.883345	34.91	43.35	110.62	135.91	6052	3
18.954189	41.97	47.75	112.57	142.12	6055	3
18.994757	28.33	40.73	168.84	181.00	875	3
19.029398	47.64	50.57	37.98	89.89	4964	3
19.094433	46.17	57.85	51.90	103.12	6052	3
19.165277	42.65	50.78	48.25	91.53	6064	2

19.307026	33.91	44.59	44.73	81.87	6042	3
19.377777	31.22	42.47	51.37	83.87	6056	2
19.448587	30.16	46.79	51.32	86.22	6054	2
19.519421	33.76	50.28	50.68	89.64	6049	3
19.590256	31.57	49.71	52.79	90.96	6048	3
19.661089	29.73	51.16	55.24	93.85	6043	5
19.731979	26.29	48.39	56.66	91.91	6048	5
19.802801	29.01	43.25	60.76	90.99	6049	7
19.873623	35.24	46.50	79.82	114.58	6056	7
19.944456	42.65	57.78	70.15	117.18	6052	15
19.989931	57.76	56.55	80.38	132.77	1721	15
20.024689	40.36	50.71	44.86	89.27	4205	9
20.084700	45.46	49.76	51.40	96.83	6050	9
20.226366	38.99	57.97	54.38	98.29	6055	6
20.297222	35.04	55.18	49.58	92.60	6064	9
20.368067	29.77	59.78	61.53	102.70	6057	9
20.438889	32.38	56.32	52.33	94.28	6055	7
20.509699	35.39	54.70	74.56	110.83	6054	15
20.580532	33.40	58.88	62.83	106.21	6055	15
20.651354	31.68	52.78	53.94	93.45	6043	9
20.722212	27.72	53.68	49.81	91.48	6048	9
20.793068	31.19	53.90	64.70	106.14	6048	22
20.867603	36.37	49.77	65.76	104.03	5406	22
20.934723	41.42	43.36	50.38	91.02	6053	6
20.985058	50.43	49.26	77.78	120.82	2553	6
21.019827	38.72	39.64	72.68	100.94	3380	3
21.074987	45.01	50.24	100.85	133.42	6057	3
21.145832	42.96	48.79	95.00	127.69	6061	0
21.216656	41.70	49.91	93.61	125.65	6057	0
21.358322	33.03	47.32	97.11	123.08	6054	0
21.429155	32.61	46.44	96.18	122.78	6056	2
21.576551	35.18	51.86	94.26	124.25	5066	3
21.641666	32.17	48.68	109.86	135.06	6050	2
21.712500	29.16	43.67	104.67	128.27	6048	2
21.783333	29.90	40.64	97.46	120.53	6047	0
21.854214	31.86	39.41	98.56	121.80	6049	0
21.924999	38.66	38.85	99.79	124.97	6051	2
21.980207	46.46	44.15	109.21	139.56	3374	2
22.014919	37.06	34.56	46.87	77.22	2548	5
22.136110	42.19	49.97	46.59	91.06	6060	9
22.206921	38.08	56.07	49.67	92.87	6058	9
22.277765	36.09	85.02	69.52	127.71	6061	9
22.348635	28.59	72.99	48.84	103.62	6055	9
22.419443	29.94	55.93	63.17	100.08	6055	15
22.490267	32.85	55.26	61.75	100.04	6053	15
22.561066	34.41	65.18	66.89	114.04	6052	18
22.631933	33.37	56.46	90.75	125.47	6052	18
22.702789	30.45	54.89	67.08	105.34	6054	18
22.773645	33.80	77.29	74.66	126.65	6043	56
22.844456	41.91	100.75	106.67	170.01	6041	56
22.915300	53.36	99.46	84.89	159.37	6054	48
22.975325	72.30	78.30	84.21	157.86	4203	48
23.010080	25.93	114.59	88.43	165.48	1722	94
23.055532	63.76	111.43	107.28	189.94	6047	94
23.126377	66.81	134.70	120.29	217.41	6046	67
23.197210	53.25	75.38	70.93	131.57	6055	67
23.268057	48.83	62.61	72.28	119.50	6064	7
23.338877	41.81	59.69	73.85	115.52	6055	7
23.409712	41.97	66.41	71.12	119.96	6059	22
23.557199	45.17	73.78	76.29	129.54	5057	22
23.622198	38.13	73.07	83.83	135.23	6049	22
23.693068	40.36	63.35	80.62	124.88	6056	12
23.734375	33.57	64.72	87.22	128.95	1003	12
24.005220	40.77	64.57	54.55	99.56	889	6
24.045788	50.55	64.74	64.03	120.87	6039	6
24.116644	57.57	70.12	63.89	127.79	6048	6
24.327326	34.83	70.03	66.07	116.02	5514	27
24.547512	34.00	56.28	73.64	110.94	5050	9
24.612499	36.74	68.10	83.84	130.12	6056	9
24.683380	33.32	69.42	88.98	131.40	6045	9
24.754469	29.74	61.30	79.60	120.43	5946	9

24.825047	32.83	60.70	78.02	119.32	6053	9
24.895868	37.06	54.40	80.75	120.30	6062	15
24.965660	46.27	66.51	79.45	129.31	5874	15
25.000717	33.35	111.15	18.25	117.67	117	7
25.036818	42.86	62.98	53.02	107.58	6048	7
25.107651	48.67	68.13	62.53	119.10	6055	7
25.249306	37.70	80.55	64.81	126.40	6057	12
25.320139	29.95	79.93	66.15	122.35	6061	7
25.390972	29.97	72.56	67.14	114.69	6056	5
25.461817	33.11	59.94	55.03	99.23	6052	5
25.532661	31.83	59.03	59.65	102.15	6051	4
25.603472	32.92	56.20	56.80	99.87	6050	4
25.674330	31.82	51.10	55.87	95.40	6053	5
25.745150	27.59	50.48	60.02	99.70	6041	5
25.815985	31.27	49.00	73.42	106.33	6056	9
25.888531	34.17	42.15	61.36	96.11	5727	6
25.957663	39.44	47.91	55.91	98.39	6057	6
25.996529	22.80	43.71	91.98	113.10	593	6
26.030926	45.86	52.25	53.20	102.39	5275	7
26.097221	47.48	60.26	57.67	109.25	6047	7
26.238890	38.89	72.56	64.00	118.70	6051	15
26.309711	31.39	51.39	50.51	87.99	6046	7
26.380568	31.36	47.30	52.80	86.92	6058	5
26.451378	30.54	45.63	52.09	85.85	6053	5
26.522245	30.07	55.81	60.75	99.46	6047	4
26.593044	32.93	50.26	48.44	88.03	6053	4
26.663935	29.30	48.05	58.31	93.62	6041	4
26.734734	27.36	44.40	53.28	87.06	6047	4
26.805601	29.17	39.86	50.82	84.06	6050	5
26.876400	32.08	46.63	65.34	102.26	6054	15
26.947256	42.87	63.71	67.27	119.53	6057	15
26.991343	56.53	43.73	85.56	132.41	1485	15
27.026075	40.12	67.46	53.11	108.49	4444	18
27.087477	44.42	54.19	27.87	86.02	6051	18
27.158321	42.05	53.15	26.56	82.09	6059	9
27.229155	39.48	56.77	23.43	81.00	6055	9
27.300013	32.02	66.96	26.04	87.14	6062	6
27.370810	27.79	51.18	24.57	70.49	6058	6
27.441586	29.25	54.90	40.40	84.55	6038	7
27.512501	27.98	62.55	27.45	82.33	6049	15
27.583332	30.06	53.48	28.81	77.10	6055	15
27.654156	27.81	70.98	40.77	96.65	6034	15
27.725080	25.47	59.46	44.93	91.68	6015	15
27.795868	27.69	64.09	64.78	111.86	6034	32
27.866713	31.48	67.17	60.91	108.90	6049	32
27.937511	39.08	76.91	59.90	121.98	6027	32
27.986435	50.26	95.13	73.72	151.08	2302	32
28.021563	37.53	48.31	57.43	99.14	3664	48
28.078461	48.17	77.12	48.90	114.74	6052	48
28.149305	45.44	58.82	37.48	93.03	6064	48
28.220127	37.40	89.54	57.15	126.80	6056	48
28.290972	34.06	65.30	31.54	91.19	6054	32
28.361807	29.37	66.30	55.05	103.63	6062	32
28.432638	32.12	51.66	37.86	82.84	6058	22
28.503471	36.05	62.37	59.62	104.33	6050	32
28.574293	37.69	59.44	44.24	94.32	6050	32
28.645126	34.24	62.28	41.51	95.62	6056	22
28.715984	30.94	61.70	51.45	99.87	6041	22
28.786829	31.30	42.91	40.44	78.42	6050	18
28.857651	30.42	49.32	34.67	78.25	6043	18
28.928495	40.00	63.30	59.85	109.48	6055	32
28.981920	57.19	64.16	84.28	134.20	3078	32
29.016689	39.23	62.72	76.31	117.35	2849	32
29.068739	49.86	71.49	46.24	110.86	6054	32
29.139584	44.02	56.91	30.83	89.15	6058	27
29.210417	43.11	59.05	41.85	96.36	6061	27
29.281250	35.75	56.63	28.26	83.97	6060	32
29.352106	27.17	62.25	55.64	104.09	6056	32
29.422928	32.86	57.80	40.79	88.73	6050	27
29.493715	35.15	60.33	70.23	108.59	6047	27
29.564571	35.83	61.35	70.65	111.22	6048	32

29.635405	32.49	59.05	54.37	98.15	6055	39
29.706263	37.73	87.18	75.51	134.61	6047	39
29.777130	34.51	59.21	50.93	100.04	6048	32
29.853924	22.06	41.18	32.96	67.15	4411	32
29.918797	37.58	47.87	34.73	81.55	6052	22
29.977060	48.74	49.48	53.63	102.24	3906	22
30.011793	36.53	64.62	57.89	107.09	2017	12
30.059029	43.51	54.32	48.90	97.83	6055	12
30.129839	45.32	47.91	56.46	98.17	6051	12
30.200684	39.61	67.42	60.61	112.29	6058	12
30.271517	36.17	49.79	56.45	93.42	6061	18
30.413195	30.53	50.10	53.28	89.70	6057	7
30.483994	32.14	50.94	48.71	90.11	6044	7
30.554873	34.18	54.18	66.85	106.49	6047	18
30.625683	34.17	52.82	58.74	100.64	6057	15
30.696564	32.16	46.67	57.59	97.41	6050	15
30.767466	30.35	57.19	66.09	108.31	6035	22
30.838228	32.11	66.47	83.82	125.93	6046	22
30.909098	40.38	50.53	63.27	106.74	6050	15
30.972269	44.93	50.76	55.90	101.30	4734	15
31.006922	31.29	45.19	70.71	100.59	1182	18
31.049307	45.66	61.36	100.27	142.48	6050	18
31.120127	49.19	61.41	109.68	150.63	6061	18
31.190985	41.79	52.18	98.02	129.50	6063	9
31.332640	32.66	53.93	104.05	133.22	6056	12
31.403473	33.06	51.29	99.83	127.56	6056	9
31.474295	32.70	52.76	95.75	126.81	6055	9
31.545103	34.33	54.98	97.01	129.76	6044	9
31.615961	35.04	51.97	109.34	141.06	6057	9
31.686794	32.05	46.40	111.64	137.93	6049	12
31.832441	35.02	43.19	93.05	121.02	5366	7
31.899328	36.63	43.22	102.80	128.70	6059	7
31.967384	43.40	45.71	105.21	134.16	5578	7
32.002094	45.27	67.89	14.11	83.62	353	9
32.039597	43.93	48.27	50.75	94.08	6051	9
32.110405	47.04	50.16	48.14	94.45	6056	9
32.181252	42.82	50.04	53.36	94.17	6061	5
32.252060	39.54	56.94	53.26	96.46	6055	7
32.322918	32.32	49.95	52.98	89.20	6059	7
32.393749	31.52	44.16	54.41	85.96	6049	3
32.464573	32.22	43.48	47.08	82.84	6058	3
32.535416	34.47	62.44	54.88	101.86	6042	15
32.606228	36.84	53.51	61.32	103.81	6048	15
32.752766	30.50	47.31	58.11	93.51	5226	9
32.818764	31.16	45.41	52.39	89.54	6051	9
32.889606	35.17	39.67	56.56	90.51	6059	12
32.960442	41.84	45.32	56.37	96.58	6043	12
32.997906	28.81	61.83	56.11	95.78	355	12
33.032661	49.29	57.40	24.93	89.70	5572	9
33.100704	47.52	49.30	22.40	80.99	6049	9
33.171551	44.73	46.97	27.33	78.90	6062	5
33.242359	39.10	45.08	15.44	66.73	6056	5
33.313183	35.73	42.73	16.73	64.19	6058	3
33.384041	32.08	43.27	18.28	64.66	6056	6
33.454849	33.19	46.57	22.23	70.15	6061	6
33.525696	36.53	51.03	41.94	86.43	6048	12
33.596516	33.99	54.10	27.73	79.60	6057	12
33.667362	34.85	58.51	50.72	96.86	6052	18
33.738216	30.48	53.05	48.34	86.12	6053	18
33.809052	31.45	47.32	24.22	73.66	6056	7
33.879860	35.20	44.05	27.38	74.21	6055	7
33.950706	42.85	42.23	23.01	73.17	6051	7
33.993103	41.09	39.41	13.69	65.84	1168	7
34.027882	42.52	49.77	45.24	89.87	4694	4
34.090961	47.20	52.43	47.62	96.32	6052	4
34.232605	39.86	55.14	52.55	96.94	6054	4
34.303471	34.41	59.50	53.99	98.78	6058	9
34.374317	32.59	46.08	48.38	83.29	6058	9
34.445141	33.71	53.10	53.96	94.48	6056	5
34.515972	33.96	55.74	45.77	90.04	6051	15
34.586758	37.67	65.84	62.61	111.73	6047	15

34.657616	33.15	48.46	62.85	98.28	6051	12
34.728497	28.35	48.80	55.44	91.48	6043	12
34.799328	30.60	42.56	60.16	93.11	6049	12
34.870152	35.81	51.57	67.50	107.72	6057	12
34.940289	43.45	52.55	61.99	106.95	5781	22
34.988228	51.14	54.93	66.80	117.73	2002	22
35.022976	31.29	46.46	32.01	76.03	3910	7
35.081249	39.73	57.93	29.51	86.46	6055	7
35.152107	37.95	47.00	17.55	70.67	6059	5
35.222904	34.85	51.57	21.08	70.90	6056	5
35.293762	30.68	52.61	21.71	71.48	6062	7
35.364582	28.02	41.09	16.87	58.23	6058	7
35.511967	28.39	43.20	25.76	66.31	5077	4
35.577072	33.48	45.97	26.86	71.05	6058	4
35.647896	31.47	49.46	26.89	73.10	6049	4
35.718750	29.14	46.68	23.69	69.01	6048	4
35.789604	26.30	50.52	28.53	72.48	6054	3
35.860462	28.20	44.17	17.77	63.14	6051	3
35.931229	34.63	47.04	31.97	78.05	6046	7
35.983322	45.59	50.26	18.52	81.82	2843	7
36.018089	28.51	40.48	23.91	62.98	3085	4
36.071514	38.26	53.55	30.43	82.81	6053	4
36.142384	35.22	53.20	24.76	76.98	6056	2
36.213184	34.46	49.74	13.07	66.51	6057	2
36.284027	31.74	42.56	13.74	59.69	6061	2
36.354851	27.01	43.14	18.03	59.73	6057	2
36.425694	27.04	45.71	21.21	64.80	6058	4
36.496517	28.23	46.25	29.96	70.33	6054	4
36.567371	33.40	47.07	28.89	73.45	6047	4
36.638184	33.15	47.03	28.20	73.74	6058	15
36.709049	27.31	52.75	33.01	77.61	6055	15
36.779873	28.93	66.69	78.00	120.18	6049	32
36.850742	36.19	86.71	90.93	153.32	6041	32
36.921562	38.11	66.14	63.71	121.34	6053	32
36.978462	40.74	49.38	33.60	85.80	3672	32
37.013229	31.08	73.97	50.38	110.70	2249	39
37.061794	42.48	81.28	58.68	125.22	6053	39
37.132648	44.94	79.63	50.22	119.49	6055	48
37.203472	40.30	88.34	46.92	121.05	6053	48
37.274296	31.88	57.31	30.55	81.07	6063	22
37.345150	30.66	49.49	31.05	76.64	6052	22
37.415985	30.18	53.61	37.43	82.63	6056	32
37.486794	33.38	60.68	51.47	97.77	6051	32
37.557606	32.85	57.32	26.71	82.11	6043	27
37.628471	35.07	70.59	46.23	103.66	6054	18
37.699329	37.15	85.94	73.42	133.02	6045	18
37.770126	33.28	77.62	68.06	124.88	6039	39
37.841007	32.47	70.23	69.83	122.59	6053	39
37.911854	36.59	57.89	47.81	99.31	6051	48
37.973564	53.93	81.89	64.61	134.29	4490	48
38.008347	29.10	59.10	52.65	100.51	1424	56
38.052082	48.91	67.38	76.44	129.29	6051	56
38.122929	46.21	63.41	40.60	101.80	6050	56
38.193764	43.97	51.28	33.02	85.45	6055	22
38.264561	37.53	49.93	31.37	77.41	6055	22
38.335419	31.15	60.09	40.09	91.68	6053	22
38.406239	31.51	47.68	39.50	80.36	6053	27
38.477074	31.07	46.24	27.24	73.29	6048	27
38.547882	38.84	79.21	43.00	110.38	6046	39
38.618713	38.05	76.37	89.89	136.04	6045	39
38.689617	37.60	75.72	61.06	119.29	6043	27
38.760441	34.29	65.05	63.55	110.04	6046	27
38.831272	34.14	64.26	54.35	105.50	6055	27
38.902073	40.17	51.95	45.44	92.70	6049	27
38.968773	43.85	52.64	41.19	93.31	5339	27
39.003483	40.04	76.66	4.85	87.14	593	22
39.042339	48.95	65.02	57.81	114.03	6041	22
39.113194	47.10	54.01	22.02	83.34	6052	22
39.184017	46.85	65.52	42.41	103.47	6059	18
39.253021	38.19	39.06	17.39	63.55	5729	6
39.325661	33.29	38.43	22.76	63.91	6047	6

39.396515	31.52	48.20	28.88	73.91	6050	12
39.467350	35.85	57.66	49.40	94.76	6052	12
39.538181	35.90	63.00	39.07	93.13	6053	15
39.609005	35.78	61.79	37.05	91.95	6051	15
39.679859	34.04	50.98	33.44	80.45	6051	15
39.750717	33.46	55.84	60.48	100.16	6040	22
39.821564	31.86	55.38	72.02	111.44	6053	22
39.892372	39.24	54.88	65.56	107.60	6052	12
39.963196	43.42	48.31	19.75	78.50	6053	12
39.999294	19.10	93.87	3.52	96.08	117	12
40.034039	45.72	43.71	25.14	78.18	5811	6
40.103462	48.63	53.64	23.98	86.79	6058	6
40.174294	47.17	64.63	44.11	104.50	6055	15
40.245152	40.54	79.87	36.21	105.79	6055	15
40.315960	32.11	65.22	26.22	87.76	6060	12
40.386818	34.47	46.06	18.33	67.47	6061	5
40.457638	34.00	41.10	23.33	67.57	6053	5
40.528461	34.04	52.61	30.92	79.53	6053	15
40.599270	36.87	63.91	53.99	104.23	6048	15
40.670151	34.01	70.87	46.48	105.01	6053	22
40.740959	29.21	50.10	39.83	84.12	6039	22
40.811829	31.12	47.96	26.82	71.85	6049	7
40.882641	36.37	44.65	30.19	75.11	6054	6
40.953484	41.87	55.47	38.76	92.74	6053	6
40.994446	31.81	44.89	27.33	71.21	950	6
41.029179	48.26	45.79	26.22	84.02	4973	12
41.093739	48.53	52.81	29.36	87.80	6056	12
41.164581	46.50	52.71	37.54	88.27	6061	9
41.235382	40.55	83.67	33.08	108.17	6049	9
41.306252	32.77	63.62	25.85	85.53	6054	15
41.377071	33.17	51.02	24.46	73.48	6048	6
41.447929	32.17	46.62	23.39	68.96	6057	6
41.518726	33.59	49.75	26.66	75.98	6049	7
41.589573	34.26	52.64	25.75	77.69	6059	7
41.660404	32.89	47.65	31.28	77.26	6047	9
41.731251	28.36	45.40	32.04	73.28	6046	9
41.802094	30.93	42.98	30.05	69.48	6052	7
41.872940	35.09	46.99	31.34	75.78	6060	7
41.943771	42.29	58.70	36.50	91.44	6058	18
41.989571	57.04	60.37	43.51	109.69	1782	18
42.024342	38.02	48.11	24.21	75.22	4144	15
42.084003	45.85	57.72	21.94	85.19	6051	15
42.154861	40.01	64.14	32.02	92.59	6062	32
42.225681	36.97	70.26	28.68	95.73	6046	32
42.296528	34.93	54.13	22.03	75.13	6060	12
42.367313	30.96	51.53	24.10	73.34	6049	12
42.438194	33.85	76.14	53.31	110.54	6056	12
42.509029	31.20	65.73	49.92	100.77	6046	9
42.579803	31.54	61.33	39.59	89.72	6046	9
42.650696	32.38	58.97	54.87	100.34	6051	15
42.725498	35.82	67.98	72.15	120.37	5339	15
42.792385	31.63	51.12	36.15	85.33	6049	12
42.863228	36.17	54.25	48.31	96.40	6055	12
42.934040	43.16	59.18	39.11	100.06	6056	32
42.984711	57.02	50.34	39.13	107.72	2610	32
43.019501	43.47	117.72	131.51	205.59	3307	80
43.074272	55.45	93.43	97.47	165.91	6021	80
43.145161	54.39	100.25	109.17	181.11	6046	80
43.215939	45.02	59.64	56.32	105.60	6049	80
43.293461	42.32	64.52	68.13	115.50	4856	80
43.357582	40.70	118.40	96.44	176.17	6021	80
43.428493	57.79	135.55	151.44	238.82	6028	111
43.499374	57.13	122.89	92.02	188.48	6021	111
43.570091	46.78	123.21	84.19	175.74	6019	67
43.640995	47.32	100.29	107.19	178.66	6030	32
43.787128	50.30	86.41	64.44	137.34	5284	18
43.853497	46.38	75.13	57.65	123.78	6049	18
43.924328	52.60	69.35	65.26	127.15	6060	15
43.979862	59.78	61.14	62.96	123.14	3434	15
44.014595	44.01	68.26	59.95	113.81	2491	18
44.064571	53.42	66.61	62.98	119.69	6057	18

44.135395	50.65	58.05	49.70	105.50	6050	7
44.206238	51.82	54.83	48.71	101.31	6059	7
44.347893	39.06	71.77	67.02	121.62	6051	12
44.418762	35.49	63.14	65.06	110.14	6050	22
44.489548	37.60	76.21	71.54	126.38	6048	22
44.560383	38.57	67.49	69.31	117.16	6047	18
44.631203	40.35	68.80	64.70	120.31	6049	18
44.702095	41.02	65.29	72.05	122.72	6055	18
44.772903	36.83	63.61	64.87	111.09	6045	9
44.843773	40.43	52.96	62.06	105.55	6055	9
44.914597	44.35	52.91	71.19	114.56	6056	12
44.974976	53.20	60.70	67.24	118.84	4264	12
45.009735	30.84	74.90	42.11	99.09	1659	22
45.054852	51.70	70.84	49.01	114.57	6054	22
45.125671	53.71	71.23	50.73	117.03	6051	32
45.196529	47.43	61.14	29.56	93.48	6062	32
45.267349	42.52	71.68	26.22	95.99	6051	27
45.338184	35.07	94.80	53.20	131.77	6057	27
45.408993	37.38	60.61	57.67	106.03	6044	32
45.479851	36.15	77.12	64.81	120.20	6045	32
45.550648	46.53	85.61	81.81	143.25	6033	56
45.621517	38.11	66.59	68.26	123.38	6048	56
45.692326	40.50	66.10	44.49	106.74	6034	39
45.763206	38.85	76.10	77.14	134.69	6053	27
45.834015	41.96	74.36	61.83	125.08	6033	27
45.904873	46.75	70.05	55.60	117.45	6051	27
45.970139	52.86	50.18	48.38	104.93	5100	27
46.004848	34.74	84.53	38.20	100.37	829	27
46.045128	50.17	68.56	48.90	110.06	6054	27
46.115936	55.03	74.86	52.43	121.61	6054	27
46.186806	49.39	60.97	40.20	99.24	6054	27
46.257591	42.74	58.44	27.14	87.35	6051	9
46.328438	36.95	46.56	21.73	71.56	6057	9
46.399296	38.14	45.67	25.87	74.26	6057	6
46.469826	32.61	49.60	25.15	72.38	5791	6
46.542141	36.06	47.39	27.29	75.15	5409	9
46.611816	39.26	50.24	21.80	77.34	6055	9
46.682640	37.40	47.39	22.32	74.44	6049	7
46.753506	33.80	48.89	29.98	78.65	6049	22
46.824329	39.22	48.65	110.62	139.97	6049	22
46.895184	33.95	46.73	115.68	142.19	6045	32
46.965302	40.20	77.20	156.04	199.69	5930	32
47.035439	38.23	71.82	148.53	185.08	6046	12
47.106239	44.23	76.19	149.39	190.04	6050	12
47.177082	51.95	90.16	163.12	213.25	6061	9
47.247906	48.90	90.23	157.78	207.60	6057	9
47.318748	40.82	70.59	172.24	205.16	6057	4
47.389595	36.33	60.51	186.25	211.07	6058	3
47.460426	34.52	60.70	207.43	230.73	6054	3
47.531261	38.52	49.73	234.40	253.49	6049	7
47.602081	42.15	53.60	251.98	271.90	6057	7
47.672928	30.70	57.98	193.17	215.96	6047	9
47.743786	35.26	53.73	79.70	113.32	6052	9
47.814617	33.62	54.09	50.39	90.77	6047	7
47.885452	35.06	50.72	45.29	87.56	6057	5
47.956249	38.21	53.35	42.21	88.83	6046	5
47.995823	26.17	48.49	48.44	79.56	710	5
48.030567	41.56	55.54	44.40	91.53	5216	3
48.096550	39.28	58.10	56.07	99.77	6049	3
48.167374	37.90	52.41	46.74	87.80	6060	3
48.238194	33.78	44.52	50.10	83.30	6059	3
48.309052	30.39	43.80	52.56	84.39	6059	4
48.379860	28.81	48.21	65.58	96.15	6055	12
48.450706	29.60	51.21	78.51	106.68	6056	12
48.521515	34.51	51.09	62.40	98.00	6045	9
48.592361	38.27	58.93	72.09	113.31	6055	9
48.663181	35.64	58.04	71.23	112.42	6040	6
48.734062	33.47	61.08	69.35	110.95	6046	6
48.879421	34.55	53.14	64.49	104.83	5428	3
48.946552	37.78	56.12	54.94	98.11	6052	3
48.990971	57.77	42.94	68.68	114.61	1544	3

49.025742	31.37	57.23	18.91	75.11	4389	0
49.086807	39.75	59.86	23.42	86.50	6047	0
49.157650	36.73	58.60	24.59	84.26	6060	2
49.228474	33.65	52.51	20.46	73.01	6055	2
49.299316	31.01	42.36	17.80	63.61	6065	2
49.370152	28.18	37.60	21.71	59.16	6058	2
49.440994	27.36	44.68	23.86	65.25	6059	2
49.511795	31.17	50.02	22.67	71.02	6042	2
49.582649	36.55	57.27	19.75	79.30	6049	2
49.653484	34.98	50.69	16.97	72.53	6053	0
49.724339	34.27	50.55	19.85	72.65	6053	0
49.795151	34.11	51.67	22.90	75.03	6051	2
49.866032	32.74	48.79	23.52	72.68	6051	2
49.936817	36.45	51.32	20.49	75.67	6056	0
49.986111	51.02	52.81	26.07	90.89	2370	0
50.020882	26.69	46.77	18.79	62.16	3559	0
50.077084	38.74	56.82	20.06	79.59	6056	0
50.147919	33.63	61.03	22.67	82.79	6058	0
50.218727	33.26	47.45	19.22	68.55	6055	0
50.289597	29.57	41.62	18.93	62.94	6053	5
50.360428	27.97	48.73	27.67	71.98	6049	5
50.431263	28.63	44.63	34.46	72.98	6053	7
50.502083	31.22	42.71	20.87	63.61	6047	3
50.572895	34.13	50.80	27.04	76.87	6045	3
50.643738	34.46	51.57	25.74	76.56	6052	3
50.714607	33.51	50.57	20.96	72.05	6050	3
50.785439	30.90	47.28	24.38	71.16	6053	3
50.856285	30.25	44.55	29.64	73.31	6047	3
50.927105	34.56	49.96	29.83	81.84	6052	3
50.981251	41.40	46.92	22.93	77.54	3199	3
51.016018	30.07	52.24	19.60	68.00	2726	2
51.067371	37.13	55.08	21.39	77.57	6049	2
51.138195	33.63	51.83	27.27	75.42	6059	3
51.209026	33.23	56.22	25.12	78.40	6050	3
51.279861	30.57	60.36	24.05	80.37	6060	6
51.350693	27.58	43.20	28.08	66.33	6050	6
51.421562	27.83	44.86	27.79	66.78	6053	4
51.492374	29.41	45.71	23.87	66.18	6053	4
51.563171	33.57	51.99	21.29	73.41	6046	2
51.634014	34.85	52.49	17.59	73.81	6050	0
51.704872	32.87	48.60	20.20	71.12	6047	0
51.775696	30.28	47.33	26.01	71.64	6041	4
51.846561	29.90	46.61	27.72	73.79	6049	4
51.917362	34.48	57.37	36.38	90.11	6046	22
51.976391	39.45	69.53	40.63	104.93	4029	22
52.011112	31.87	43.12	48.04	86.56	1901	22
52.057594	35.37	65.64	33.77	94.25	6037	22
52.128460	35.67	74.95	66.78	126.55	6034	39
52.199284	29.40	63.47	32.72	86.76	6053	39
52.270172	28.28	66.62	30.28	87.51	6053	15
52.340984	25.17	67.89	39.13	93.19	6060	15
52.411831	24.72	42.82	31.52	67.61	6050	12
52.482639	29.08	55.54	29.57	77.13	6050	12
52.553459	30.82	64.31	29.83	85.47	6051	22
52.624294	34.61	69.65	50.72	103.05	6053	22
52.695187	33.73	61.85	55.87	102.31	6037	39
52.765984	31.41	58.14	45.43	93.84	6049	12
52.836842	33.81	52.02	21.69	75.88	6048	12
52.907661	35.86	46.02	30.62	79.38	6052	7
52.971539	37.93	56.98	34.49	90.25	4857	7
53.006248	33.93	38.17	10.95	54.70	1069	7
53.047882	37.45	57.91	29.06	83.62	6035	7
53.118752	37.62	60.15	27.95	85.89	6056	7
53.189583	36.56	51.04	23.49	73.98	6059	9
53.258785	31.87	45.05	22.74	68.47	5775	3
53.331261	28.24	40.25	24.14	63.45	6057	3
53.402084	27.45	40.44	22.58	62.20	6052	3
53.472904	29.13	40.82	22.71	63.82	6049	3
53.543728	33.07	49.31	26.00	74.14	6049	7
53.614571	33.70	47.11	23.80	70.67	6049	7
53.685440	30.03	52.81	27.32	73.45	6056	6

53.756271	32.45	48.74	24.62	70.67	6046	4
53.827106	28.80	51.01	27.55	72.53	6044	4
53.897942	29.71	47.82	32.04	73.00	6056	6
53.966679	31.65	51.12	30.22	76.95	5694	6
54.001400	23.93	64.26	10.77	69.78	235	7
54.038193	29.41	56.83	32.56	80.85	6041	7
54.109028	31.18	58.68	28.06	79.47	6057	7
54.179874	31.34	55.87	26.30	76.62	6057	3
54.250683	28.77	53.55	18.34	70.35	6057	6
54.321514	25.11	63.28	25.65	81.51	6053	6
54.392384	23.96	50.72	25.06	69.33	6055	15
54.463196	26.51	62.06	37.29	86.08	6054	15
54.533901	30.38	72.34	67.10	117.31	6009	27
54.604851	34.38	62.82	51.70	99.28	6050	27
54.675716	31.76	57.91	35.49	85.43	6043	18
54.746552	32.96	54.39	42.00	88.69	6038	18
54.817383	32.15	57.35	35.64	84.39	6047	4
54.888195	30.65	55.92	39.43	84.48	6051	6
54.959026	30.21	56.25	32.06	80.42	6048	6
54.997211	41.07	40.40	15.83	68.06	473	6
55.031933	29.57	62.91	40.86	89.82	5452	15
55.099281	28.65	62.42	36.77	86.44	6051	15
55.170139	33.45	71.39	41.74	99.75	6050	39
55.240948	28.74	85.07	33.75	106.82	6056	39
55.311806	27.12	51.75	26.16	73.15	6050	22
55.382664	28.50	66.77	49.26	99.17	6056	39
55.453506	29.67	63.59	43.98	95.64	6038	39
55.524376	30.14	62.93	61.16	105.72	6016	27
55.595127	36.96	73.27	62.73	120.43	6043	27
55.665974	37.76	57.08	51.17	99.38	6052	27
55.736828	37.35	68.94	52.08	108.62	6043	27
55.807663	30.84	50.23	37.66	81.17	6051	32
55.878483	35.23	54.89	60.04	101.04	6051	39
55.949329	40.57	49.58	45.74	91.96	6058	39
55.992359	48.13	52.99	51.26	105.11	1307	39
56.027119	42.62	62.85	53.07	102.83	4624	22
56.089584	44.59	58.27	49.18	100.25	6055	22
56.160427	45.57	67.77	55.50	110.84	6058	32
56.231239	34.70	70.45	39.96	97.28	6059	32
56.302082	33.33	62.56	41.07	96.41	6056	27
56.372917	29.00	48.66	30.25	71.91	6060	27
56.443748	29.39	49.16	31.92	75.48	6055	18
56.514572	32.42	57.26	44.57	89.87	6052	22
56.585403	33.14	47.55	31.58	75.48	6055	22
56.656227	31.68	50.43	36.24	79.89	6044	18
56.727081	29.29	46.86	38.25	76.63	6047	18
56.797951	29.33	43.85	37.10	75.93	6051	9
56.868774	30.08	42.37	44.81	78.35	6052	9
56.939606	35.16	50.21	42.09	84.56	6058	15
56.987488	48.50	56.02	45.03	98.62	2139	15
57.022282	33.93	47.44	49.07	85.98	3789	15
57.079861	44.01	61.08	46.74	101.42	6055	15
57.150684	38.59	58.03	49.01	94.89	6056	12
57.363205	29.54	51.75	63.73	96.69	6056	15
57.434052	26.93	59.19	62.18	100.16	6054	18
57.510185	30.88	52.40	50.34	89.13	5121	7
57.575672	32.33	50.04	53.71	92.14	6047	7
57.646503	31.76	49.63	54.27	91.95	6055	15
57.717373	29.88	47.77	63.51	98.84	6046	15
57.788219	30.44	47.77	68.08	101.78	6055	27
57.859062	33.39	60.53	66.09	110.58	6048	27
57.929897	35.54	53.96	51.59	95.09	6054	18
57.982605	41.11	57.88	58.34	104.28	2955	18
58.017384	41.14	60.51	39.41	93.54	2967	22
58.070148	42.12	58.71	35.29	88.97	6055	22
58.140968	38.58	56.78	36.87	88.35	6003	7
58.211945	36.82	59.33	28.52	82.75	6025	7
58.282650	33.46	64.30	21.60	83.21	6055	9
58.353485	28.93	47.96	22.12	67.79	6058	9
58.424305	27.87	48.17	24.12	68.14	6047	15
58.495140	29.27	45.94	28.16	69.32	6054	15

58.565880	33.66	58.36	41.29	88.52	6029	18
58.636784	31.31	51.36	38.51	81.59	6053	15
58.707626	30.35	48.27	42.90	80.71	6041	15
58.778484	27.23	45.47	39.48	75.81	6052	9
58.849304	27.81	46.39	41.81	80.05	6042	9
58.920162	35.35	50.94	34.97	80.46	6057	9
58.977757	35.75	55.81	38.58	86.05	3788	9
59.012501	34.57	42.53	23.91	68.50	2137	15
59.060406	38.02	53.62	30.62	80.33	6047	15
59.131237	40.90	71.87	66.80	119.69	6056	27
59.202061	38.67	86.58	45.45	115.83	6054	27
59.272919	31.76	62.99	34.31	85.92	6057	15
59.343761	28.47	46.72	25.12	67.94	6060	15
59.414581	27.20	49.81	30.41	72.57	6055	15
59.485394	33.05	59.01	54.16	97.56	6048	15
59.556236	38.30	61.36	53.27	103.81	6049	27
59.627083	37.91	47.28	32.39	79.72	6053	12
59.697941	39.02	53.06	34.50	85.56	6055	12
59.768772	34.81	50.02	32.21	78.19	6054	7
59.839607	32.26	47.77	32.59	75.60	6051	7
59.910450	35.73	47.27	39.21	82.06	6061	9
59.972927	38.31	50.39	35.45	82.63	4621	9
60.007648	26.93	42.59	38.28	71.67	1307	3
60.050694	35.49	55.10	41.65	87.31	6053	3
60.121529	34.90	56.58	44.04	89.38	6055	3
60.192371	36.61	53.57	42.40	86.85	6060	5
60.256111	33.91	54.06	43.21	86.36	4813	9
60.334015	27.70	51.89	49.65	87.31	6058	9
60.404884	25.18	51.00	57.11	89.67	6046	15
60.475693	29.59	53.46	50.04	90.25	6054	15
60.546505	32.75	51.75	48.60	88.91	6039	9
60.617352	34.66	51.75	53.60	93.35	6057	9
60.688206	33.60	49.77	52.52	92.39	6050	5
60.833969	31.00	48.72	44.59	83.38	5353	4
60.900719	31.87	48.40	52.68	89.32	6060	5
60.968056	34.97	46.68	51.38	87.61	5445	5
61.002789	38.88	70.79	12.59	82.72	473	9
61.040962	35.53	56.59	35.52	84.04	6052	9
61.111805	36.66	55.07	32.07	81.83	6052	9
61.182640	34.30	78.59	38.62	103.45	6048	22
61.253460	31.17	90.41	53.86	123.60	6049	32
61.324306	29.82	108.22	58.53	138.98	6048	32
61.395172	28.21	56.84	45.75	89.34	6047	22
61.465973	30.73	62.33	61.61	107.47	6043	22
61.536781	31.33	53.66	52.48	94.13	6039	18
61.607628	37.83	58.11	70.42	113.72	6048	18
61.678459	38.16	60.30	61.28	110.28	6044	18
61.749329	35.14	54.03	39.28	87.20	6046	18
61.820175	32.57	59.61	41.96	91.95	6040	15
61.891006	33.99	52.03	43.45	87.13	6049	32
61.961842	38.72	66.12	40.57	97.72	6047	32
61.998611	22.50	113.28	9.21	117.15	237	32
62.033344	43.04	68.09	64.88	116.12	5687	39
62.102058	45.96	70.87	51.31	111.05	6041	39
62.172916	38.13	86.19	47.08	115.83	6057	18
62.243736	33.81	58.17	23.80	78.14	6054	18
62.314583	30.29	45.13	19.85	65.57	6050	6
62.385441	29.23	41.75	25.47	65.00	6050	4
62.456261	28.46	42.29	23.15	63.16	6058	4
62.527096	32.46	47.15	27.08	71.69	6042	7
62.597893	34.79	47.44	23.71	72.37	6050	7
62.668762	32.46	51.51	25.79	75.08	6052	4
62.739582	31.82	46.56	29.36	71.08	6041	4
62.810452	31.47	46.38	29.17	70.81	6040	3
62.881248	30.81	47.44	41.54	79.16	6048	7
62.952106	34.80	52.62	35.04	82.26	6048	7
62.993752	34.66	55.35	29.42	78.44	1069	7
63.028496	36.07	50.69	29.71	77.88	4857	4
63.092373	36.83	56.13	28.71	80.69	6052	4
63.163219	36.51	60.10	23.82	80.93	6061	2
63.233875	34.26	48.03	17.07	66.53	6031	2

63.304005	30.21	43.98	15.80	61.44	5898	2
63.375706	27.49	40.36	18.75	59.06	6050	4
63.446529	26.76	42.23	21.20	61.40	6060	4
63.517338	31.25	45.82	32.73	73.34	6048	7
63.588161	33.68	50.55	36.75	80.79	6052	7
63.658981	31.14	57.79	28.28	79.74	6042	5
63.729885	31.12	50.02	34.41	76.05	6046	5
63.800682	30.19	45.38	34.96	74.07	6038	9
63.871540	30.75	48.02	45.86	84.10	6053	9
63.942360	33.40	53.88	38.60	84.17	6047	6
63.988876	52.21	57.24	40.79	97.49	1899	6
64.023659	26.12	48.59	22.01	67.62	4032	0
64.082619	37.63	57.88	29.65	82.93	6046	0
64.153473	34.78	58.05	26.12	79.00	6063	0
64.224281	33.94	49.16	16.74	67.06	6050	0
64.295151	30.08	46.14	17.19	63.25	6062	2
64.366493	26.89	39.50	17.52	56.78	5964	2
64.436813	24.91	42.77	17.36	59.20	6056	3
64.507652	28.99	47.66	21.80	66.87	6055	6
64.578461	31.89	53.95	25.26	75.25	6055	6
64.649307	32.01	50.09	40.93	81.67	6054	7
64.720154	31.46	48.19	26.60	72.71	6050	7
64.790993	30.29	46.69	29.51	70.69	6052	3
64.861832	29.51	48.23	30.87	72.23	6045	3
64.932663	32.71	48.47	30.29	74.41	6053	3
64.984032	41.36	47.93	36.11	81.55	2724	3
65.018822	27.67	50.05	21.75	69.06	3192	2
65.072906	35.47	56.09	27.25	79.10	6054	2
65.143753	32.31	66.80	33.40	88.40	6057	7
65.214584	32.73	61.20	25.60	82.80	6055	7
65.285431	29.90	47.40	14.11	62.88	6062	3
65.356247	26.69	45.68	21.80	63.36	6057	3
65.427116	24.53	51.99	30.17	72.27	6053	4
65.497902	28.17	47.75	25.19	68.98	6047	4
65.568726	32.01	53.19	24.89	73.56	6049	5
65.639580	32.14	50.60	31.77	76.98	6053	6
65.710419	32.23	48.82	39.06	81.46	6046	6
65.781273	29.59	46.90	41.43	80.20	6050	7
65.852119	28.14	58.19	43.55	90.67	6047	7
65.922943	33.19	60.54	42.85	93.82	6043	15
65.979141	34.55	51.35	41.21	82.81	3553	15
66.013901	34.38	58.27	21.68	78.51	2376	6
66.063187	34.78	56.46	27.43	79.11	6042	6
66.134018	32.69	59.55	28.11	81.87	6057	9
66.204849	34.47	65.09	26.85	85.31	6059	9
66.275696	31.59	79.48	30.23	98.26	6044	15
66.346474	26.92	89.42	60.02	121.66	6046	15
66.417374	22.34	55.57	33.65	75.83	6048	15
66.488197	25.61	64.55	41.44	91.11	6051	15
66.559013	28.33	61.41	39.62	88.07	6049	12
66.629829	31.83	55.89	30.35	79.12	6048	15
66.700706	32.34	56.25	49.10	92.06	6054	15
66.772163	29.08	55.76	56.76	96.10	5880	9
66.842400	29.16	53.70	53.23	93.38	6045	9
66.913216	33.54	46.70	40.16	81.06	6055	15
66.974281	40.34	50.43	47.12	92.31	4384	15
67.009026	34.96	54.83	21.96	75.35	1543	15
67.053436	42.36	67.11	56.18	108.11	6048	15
67.124283	41.62	67.14	59.41	110.82	6053	15
67.195160	38.86	94.81	54.99	126.42	6050	22
67.265945	35.74	77.58	39.46	103.26	6056	18
67.336807	27.19	74.83	35.03	96.78	6059	18
67.407654	25.33	71.04	46.18	97.99	6050	15
67.478493	27.59	58.32	37.33	83.31	6048	15
67.549278	31.55	61.42	38.51	87.91	6044	15
67.620125	34.13	62.82	63.16	106.15	6053	15
67.690994	31.14	49.07	32.83	78.90	6049	15
67.761818	31.36	44.59	26.43	69.61	6048	12
67.832664	30.98	52.70	53.67	92.65	6045	12
67.903496	34.79	56.24	62.02	102.48	6056	18
67.969437	39.24	56.02	50.66	97.59	5214	18

68.004181	42.78	71.25	7.88	84.42	711	9
68.043762	38.99	64.86	41.19	96.09	6045	9
68.114571	42.32	59.14	35.46	91.42	6057	9
68.185417	39.76	95.63	55.84	128.84	6055	12
68.256241	34.57	65.00	22.32	82.62	6054	6
68.327057	31.08	54.53	38.58	84.12	6060	6
68.397903	25.99	63.95	40.15	89.06	6048	15
68.468727	26.14	66.41	45.66	93.92	6051	15
68.539551	29.47	65.74	46.63	95.13	6048	15
68.610405	32.70	69.46	55.62	106.50	6048	15
68.681252	35.03	63.15	50.24	100.56	6048	27
68.752121	32.89	64.07	80.53	124.36	6043	22
68.822929	35.26	71.36	76.20	125.40	6050	22
68.893776	37.26	62.22	57.08	107.20	6054	7
68.964584	41.97	50.83	34.87	85.66	6055	7
69.034737	46.50	56.34	37.44	92.41	5928	9
69.104851	46.48	59.51	36.20	92.86	6056	9
69.175705	43.62	63.02	33.15	91.12	6059	3
69.246506	41.65	56.12	19.47	77.60	6057	3
69.317352	34.06	47.66	20.32	69.09	6058	2
69.388184	32.33	45.21	19.39	66.30	6053	3
69.459007	30.30	45.96	18.92	66.26	6053	3
69.529861	33.84	53.13	31.40	79.64	6047	6
69.600685	35.36	55.85	24.10	79.21	6057	6
69.671509	33.99	50.33	19.87	71.78	6049	3
69.742363	29.28	42.18	27.40	66.97	6043	3
69.813217	29.83	46.27	26.89	68.95	6054	4
69.884026	32.85	42.67	37.93	73.60	6051	4
69.954849	38.65	44.31	35.66	77.54	6055	4
69.995125	25.08	46.96	27.61	64.67	831	4
70.029877	43.18	45.74	33.39	80.60	5094	4
70.095116	41.31	52.57	41.82	88.82	6051	4
70.165962	39.00	56.45	39.75	87.97	6052	3
70.236755	37.26	47.58	40.13	80.01	6052	3
70.307625	30.67	49.29	39.96	79.05	6058	5
70.378487	29.22	61.30	58.09	99.10	6046	7
70.449280	30.47	59.78	60.60	101.52	6048	7
70.520119	33.65	62.21	61.23	104.60	6042	9
70.590958	33.66	62.42	74.29	116.91	6045	9
70.661804	31.63	58.73	67.41	110.46	6041	9
70.807732	35.89	58.75	68.39	111.48	5312	7
70.874306	35.07	64.01	72.73	119.20	6051	7
70.945160	44.28	55.59	64.90	112.46	6050	27
70.990257	63.49	85.10	88.59	158.16	1662	27
71.025002	40.38	62.12	56.81	102.89	4262	22
71.086571	52.98	70.98	60.41	119.64	5831	22
71.156235	48.05	74.43	50.94	113.47	6059	18
71.227051	42.32	59.76	28.01	85.39	6051	18
71.297905	35.67	74.34	46.48	108.73	6056	12
71.368736	31.87	65.48	47.34	98.21	6055	12
71.439583	30.23	56.97	39.70	84.09	6056	6
71.510406	32.87	58.42	42.42	90.01	6052	22
71.581238	34.57	59.26	59.45	103.34	6055	22
71.652069	33.58	56.35	40.51	88.55	6053	7
71.722939	33.17	57.70	57.34	101.32	6042	7
71.793770	32.92	54.76	51.67	94.94	6053	5
71.864586	32.83	56.77	48.44	94.99	6049	5
71.935425	38.31	53.83	43.57	91.16	6058	9
71.985397	47.30	60.68	44.78	101.67	2490	9
72.020172	35.49	60.30	48.23	95.63	3432	12
72.075668	47.80	73.85	51.01	113.69	6046	12
72.146515	40.08	64.14	38.89	92.77	6061	22
72.217339	43.68	83.12	52.04	116.90	6039	22
72.288208	36.05	82.17	43.72	109.18	6051	27
72.370094	19.48	56.92	28.52	72.89	4071	27
72.429863	26.06	55.46	28.42	75.54	6058	32
72.500687	31.02	62.48	53.05	99.99	6046	27
72.571480	29.44	66.82	30.26	87.33	6046	27
72.642365	33.51	56.58	33.96	83.87	6051	15
72.713219	31.77	51.07	38.68	82.47	6049	15
72.784042	30.06	45.56	26.78	69.47	6050	7

72.854828	30.14	47.70	25.42	70.10	6042	7
72.925728	35.14	47.31	42.95	82.96	6058	9
72.980530	40.80	55.70	55.63	100.04	3315	9
73.015266	42.62	72.31	52.58	108.31	2603	12
73.065964	44.85	65.91	43.18	100.28	6054	12
73.136757	39.68	80.90	47.15	111.80	6051	5
73.207619	38.11	64.62	24.71	85.96	6057	5
73.278458	36.61	47.34	16.28	67.11	6057	2
73.349297	31.29	45.77	20.83	66.01	6057	2
73.420151	27.26	43.85	22.17	63.00	6043	0
73.490974	29.70	45.36	23.47	67.32	6054	0
73.561783	32.42	49.42	24.10	71.24	6055	0
73.632614	34.25	47.99	23.60	71.24	6051	0
73.703484	31.78	45.99	24.86	69.19	6049	0
73.774330	28.90	44.22	26.96	67.49	6052	6
73.845161	29.97	41.22	40.01	75.68	6051	6
73.915993	34.60	42.93	47.10	84.57	6056	6
73.975685	42.20	50.60	54.14	97.25	4144	6
74.010414	33.78	41.33	31.57	70.38	1777	7
74.056252	41.91	54.55	38.64	90.14	6052	7
74.127075	41.95	56.18	35.03	87.47	6056	6
74.197906	41.81	64.22	34.58	90.97	6059	6
74.268753	38.69	61.64	23.34	82.26	6055	4
74.339561	30.78	55.05	29.53	76.91	6060	4
74.410416	27.66	53.91	31.39	77.78	6052	6
74.481247	28.75	45.87	31.37	71.37	6049	6
74.552063	32.25	51.56	26.90	74.42	6043	4
74.620407	32.84	53.69	34.69	80.43	5370	4
74.693260	30.95	47.45	28.52	73.85	4562	5
74.764275	33.65	51.29	26.96	75.48	5172	6
74.835777	33.53	47.92	33.86	78.40	5341	6
74.906479	34.43	48.60	48.87	88.77	6000	6
74.970848	36.89	50.20	38.76	84.60	4979	6
75.005577	32.58	54.93	12.42	66.65	950	3
75.046539	34.75	53.43	37.00	83.61	6046	3
75.117363	35.91	60.29	34.29	87.68	6059	3
75.188194	36.27	55.17	27.30	79.38	6058	0
75.259026	33.19	56.34	20.98	74.86	6052	2
75.329865	28.55	58.09	23.83	75.78	6062	2
75.477150	25.66	53.09	21.92	68.75	5091	2
75.542374	30.96	50.77	22.66	70.44	6037	2
75.613182	34.83	51.84	23.50	74.21	6052	2
75.684013	33.04	45.31	23.03	68.78	6045	3
75.754883	32.97	42.37	27.99	69.18	6048	2
75.825706	31.57	45.53	28.39	71.12	6055	2
75.896553	32.21	47.80	30.98	74.49	6053	0
75.965996	33.91	48.83	26.35	73.88	5814	0
76.000717	25.05	76.40	18.86	82.75	117	0
76.036819	32.02	52.42	27.57	76.18	6053	0
76.107651	32.76	55.39	30.52	79.58	6051	0
76.178474	34.08	54.32	29.22	78.60	6058	0
76.249306	30.56	47.32	18.69	65.38	6059	0
76.320137	27.02	44.41	23.11	63.47	6056	0
76.391029	23.67	42.81	17.91	57.81	6044	2
76.461784	25.92	45.00	17.26	60.44	6039	2
76.532661	29.16	43.94	22.44	63.86	5097	2
76.608887	31.50	47.50	24.80	69.59	5119	2
76.674332	31.84	48.90	25.79	72.12	6043	3
76.745148	31.98	48.03	25.94	71.09	6042	3
76.815994	30.90	49.47	25.88	71.43	6055	3
76.886818	30.71	50.74	32.45	75.86	6050	4
76.957672	31.71	49.88	28.29	74.48	6055	4
76.996529	40.97	41.47	18.20	69.04	592	4
77.031410	29.42	52.93	29.53	77.28	5182	7
77.097214	31.50	58.03	32.09	81.55	6051	7
77.168053	32.65	57.73	31.46	82.29	6060	5
77.238899	28.82	51.19	20.87	69.69	6050	5
77.309723	25.77	50.32	23.85	67.77	6058	6
77.380569	24.53	48.39	23.03	65.58	6061	6
77.451401	25.03	56.99	28.05	75.02	6049	6
77.522224	27.24	48.97	21.26	66.23	6048	6

77.593063	34.35	50.75	27.04	74.97	6052	6
77.663910	32.94	54.82	20.69	73.72	6054	2
77.734741	32.48	53.12	29.57	75.94	6044	2
77.805588	32.43	50.75	29.99	75.39	6045	2
77.876411	31.09	52.30	34.56	78.09	6058	0
77.947258	32.63	52.75	29.71	77.52	6058	0
77.991356	48.36	56.98	37.21	93.92	1484	0
78.026085	27.46	52.35	26.66	73.00	4447	0
78.087486	31.34	57.48	30.60	80.75	6044	0
78.158333	32.97	61.54	27.62	82.80	6060	2
78.229141	29.88	50.83	17.69	67.54	6055	2
78.300003	26.95	47.00	21.67	65.57	6054	2
78.370819	24.55	47.46	21.61	65.40	6048	2
78.441658	24.66	48.82	21.29	64.97	6048	6
78.512497	28.24	49.05	21.86	66.82	6047	6
78.583321	32.14	58.50	27.66	79.96	6053	6
78.654190	31.84	53.49	32.26	79.54	6049	7
78.725014	34.22	53.25	30.62	81.02	6043	7
78.795868	32.53	48.55	40.10	82.40	6052	15
78.866722	30.41	50.60	48.10	87.62	6052	15
78.937500	32.76	54.96	32.37	82.28	6049	6
78.986473	43.91	57.78	52.81	99.65	2311	6
79.021225	27.40	56.76	26.98	77.98	3617	7
79.077782	35.31	64.87	39.19	92.36	6049	7
79.148613	31.64	71.60	37.64	97.67	6057	15
79.219437	31.29	70.27	33.26	93.43	6056	15
79.290276	28.98	71.15	35.38	95.85	6060	7
79.361137	27.18	58.38	41.82	87.14	6053	7
79.431969	25.10	58.77	36.54	82.96	6052	6
79.502792	26.95	51.65	34.00	77.10	6045	7
79.573624	31.16	48.34	33.71	79.62	6052	7
79.644455	31.41	52.12	25.55	75.08	6050	6
79.715324	35.40	51.53	28.79	79.45	6043	6
79.786133	32.32	52.69	31.86	78.35	6051	6
79.856972	31.58	54.37	30.76	79.20	6050	6
79.927803	34.15	54.90	33.86	82.65	6056	4
79.981598	42.31	47.55	49.50	90.57	3141	4
80.016365	26.63	69.02	28.56	87.13	2784	4
80.068054	33.50	68.20	52.22	104.38	6048	4
80.138901	31.82	77.75	73.00	128.05	6042	2
80.209709	33.08	65.67	78.34	124.20	6055	2
80.280533	31.48	52.69	80.31	113.05	6050	5
80.351410	28.88	51.05	90.84	117.60	6059	5
80.422241	30.58	68.00	100.70	136.67	6050	15
80.493057	31.57	56.35	51.53	93.94	6054	15
80.563873	36.04	51.18	34.55	79.97	6053	12
80.634720	39.16	54.68	32.01	84.55	6051	3
80.705582	36.64	60.32	25.90	83.31	6054	3
80.776390	35.28	56.94	29.52	81.44	6045	2
80.847260	33.45	56.75	23.27	78.53	6055	2
80.918068	34.94	55.13	25.59	80.73	6046	3
80.956490	45.68	43.16	10.57	72.26	513	3
81.058876	34.71	62.54	23.44	84.55	5954	2
81.129181	31.37	61.21	23.14	82.21	6055	2
81.199989	31.61	56.34	22.71	77.77	6056	2
81.267883	31.38	56.16	21.66	78.32	5540	5
81.341850	28.28	48.29	20.90	69.22	6023	5
81.412514	28.11	47.78	26.54	68.95	6057	3
81.483353	30.60	49.27	21.70	69.73	6045	3
81.554146	35.46	57.00	24.10	79.49	6039	6
81.624985	37.97	55.25	23.34	79.65	6048	6
81.695847	33.79	68.91	23.46	87.85	6048	6
81.766716	32.18	56.59	34.60	82.53	6048	5
81.837509	31.88	58.61	24.50	80.08	6046	5
81.908371	33.46	59.88	26.92	82.28	6055	0
81.971863	36.12	68.37	27.54	93.17	4792	0
82.006607	31.37	25.73	13.46	46.33	1129	6
82.048622	34.28	63.37	27.76	87.15	6047	6
82.119431	31.72	65.32	30.63	89.09	6055	6
82.190300	34.12	64.93	39.68	93.46	6056	9
82.261101	29.85	53.55	29.75	77.64	6059	12

82.331947	26.55	61.99	32.32	84.64	6059	12
82.402718	28.50	63.42	29.47	84.14	6042	7
82.473610	29.31	59.83	31.06	81.64	6053	7
82.544418	33.56	58.38	39.05	86.97	6037	15
82.615288	35.72	74.65	45.16	107.92	6047	15
82.686172	30.22	69.54	48.85	102.20	6043	18
82.756989	29.19	61.31	50.80	96.39	6038	18
82.827827	30.27	64.23	37.74	88.81	6052	18
82.898659	33.14	51.30	35.31	82.62	6048	12
82.967049	34.71	66.43	48.04	100.17	5625	12
83.001747	34.63	83.13	29.61	95.22	295	15
83.038887	34.15	61.33	33.68	88.90	6053	15
83.109734	34.47	65.31	48.71	101.06	6053	15
83.180565	32.55	63.26	38.33	90.96	6059	18
83.251373	31.76	68.47	30.16	92.81	6057	12
83.322220	29.44	68.73	32.11	92.04	6049	12
83.393059	28.30	53.49	33.53	80.11	6058	15
83.463890	29.60	58.84	32.25	81.88	6057	15
83.534714	33.89	57.03	51.25	95.31	6046	22
83.605545	36.14	62.69	37.40	94.07	6052	22
83.676399	33.49	64.09	51.92	101.32	6049	18
83.717766	33.02	60.83	21.68	77.98	1009	18
84.276932	22.08	55.62	52.85	79.85	26	5
84.312515	28.42	53.30	28.69	78.18	6054	5
84.383347	27.37	47.39	21.64	67.01	6061	15
84.454193	27.72	52.17	19.61	70.43	6056	15
84.524979	37.27	60.08	52.93	102.07	6040	22
84.595825	36.76	67.04	51.64	106.74	6040	22
84.666679	35.70	54.25	36.03	86.21	6056	18
84.737534	34.85	59.09	35.65	85.87	6048	18
84.808342	36.00	57.34	27.09	83.26	6049	5
84.879181	33.02	64.69	39.68	90.52	6053	6
84.950020	36.31	61.54	34.71	89.42	6052	6
84.992706	41.94	61.32	21.84	85.68	1247	6
85.027466	34.93	55.70	39.65	88.74	4682	7
85.090279	36.60	57.65	37.56	87.84	6054	7
85.172775	26.23	71.21	35.63	93.70	3912	9
85.231956	32.21	61.91	28.56	86.36	6055	9
85.302803	31.34	62.09	36.88	90.91	6054	9
85.373627	28.42	49.61	27.09	73.00	6060	9
85.444458	29.32	61.02	35.90	87.83	6054	6
85.515259	32.88	49.68	34.15	76.27	6047	5
85.586090	40.24	58.82	16.06	80.87	6049	5
85.656937	35.36	62.81	28.86	87.29	6055	15
85.727814	36.56	54.60	44.30	91.18	6049	15
85.798645	33.04	66.05	28.21	85.78	6053	12
85.869492	32.33	60.26	30.57	84.11	6050	12
85.940315	35.46	56.31	27.03	82.02	6053	2
85.987862	54.08	51.55	24.42	91.29	2075	2
86.022614	25.17	60.68	29.28	78.73	3854	2
86.080544	37.24	60.55	33.97	89.16	6055	2
86.151413	34.32	66.75	29.81	90.18	6059	0
86.222221	32.71	53.30	24.19	76.81	6060	0
86.293068	31.69	49.02	24.38	76.30	6057	3
86.363914	29.53	45.68	22.35	67.88	6056	3
86.434746	28.91	48.75	21.24	68.92	6053	3
86.505554	32.98	49.44	19.52	70.54	6054	3
86.576363	36.11	53.29	20.75	74.76	6053	3
86.647209	36.88	55.99	30.30	85.83	6053	6
86.718086	35.05	56.33	34.12	83.87	6048	6
86.788925	33.53	53.37	32.83	80.90	6053	5
86.859779	32.14	60.84	28.61	81.88	6054	5
86.931305	35.30	64.31	41.90	94.86	5912	5
86.982971	42.92	45.97	24.51	77.74	2902	5
87.017731	29.04	74.45	33.79	97.23	3020	4
87.070824	37.01	61.38	29.62	86.67	6051	4
87.141678	33.91	70.19	32.03	95.71	6063	5
87.212502	33.96	55.65	33.89	82.92	6057	5
87.283310	32.78	52.12	33.10	82.48	6046	4
87.354156	29.17	44.26	20.93	66.94	6048	4
87.424980	29.35	50.42	21.21	70.83	6046	3

87.495834	32.90	51.21	25.25	74.23	6051	3
87.566635	36.61	53.23	18.32	74.37	6048	5
87.637466	33.64	53.54	25.43	75.61	6048	3
87.708382	30.51	49.39	35.17	76.86	6046	3
87.779213	27.04	43.87	32.14	68.80	6050	3
87.850044	28.53	45.52	28.07	69.15	6049	3
87.920845	32.28	49.92	34.83	76.68	6054	4
87.959053	29.42	44.71	16.85	65.01	475	4
88.061470	36.30	56.38	37.64	85.70	5983	6
88.131966	36.06	54.64	34.61	83.71	6054	6
88.202766	34.93	66.04	35.60	92.52	6059	6
88.273613	32.48	58.93	29.97	81.98	6060	5
88.344444	28.09	54.04	24.74	72.69	6061	5
88.415268	26.91	48.24	32.50	72.45	6054	5
88.486504	27.13	48.74	26.37	70.00	5878	5
88.556969	32.33	49.74	26.16	73.28	6046	3
88.627769	33.48	55.02	26.76	77.48	6057	3
88.698647	29.52	48.74	27.95	71.09	6052	3
88.769470	27.41	44.18	33.02	69.05	6046	2
88.840309	28.58	47.87	35.43	75.60	6055	2
88.911156	31.81	49.18	34.40	76.29	6058	0
88.973267	35.32	57.71	39.25	88.11	4563	0
89.007996	34.17	25.44	12.39	47.95	1368	2
89.051392	34.83	55.74	37.23	85.37	6053	2
89.122231	35.66	56.38	32.22	83.13	6053	2
89.193054	36.18	48.20	24.87	72.41	6051	2
89.263901	34.32	42.86	22.98	66.85	6061	3
89.334724	29.93	42.10	23.00	64.27	6053	3
89.405563	31.37	44.65	19.10	65.78	6056	4
89.476379	27.66	47.20	28.37	70.74	6051	4
89.547218	31.42	48.37	27.95	72.55	6051	4
89.618057	33.10	52.34	30.23	77.14	6054	4
89.688904	28.62	68.94	33.89	89.91	6047	4
89.759766	24.55	51.17	44.20	81.30	6047	27
89.830605	25.50	54.42	61.39	96.38	6047	27
89.901436	33.93	53.56	53.82	96.90	6055	32
89.968430	39.64	73.05	53.64	112.09	5391	32
90.003136	47.47	69.34	12.60	86.43	534	15
90.041664	36.37	56.05	37.58	86.82	6052	15
90.112549	37.63	53.40	36.90	84.78	6045	15
90.183319	35.88	57.54	31.97	83.31	6058	9
90.254158	35.39	48.25	22.72	69.82	6059	7
90.324989	30.31	48.19	24.42	69.87	6048	7
90.395859	28.31	51.18	31.30	74.65	6046	4
90.466652	28.75	50.93	31.77	74.63	6048	4
90.537498	32.15	49.01	29.09	74.56	6042	9
90.608345	33.98	52.40	42.77	85.42	6045	9
90.679192	29.30	48.87	39.55	77.69	6051	9
90.750061	26.28	52.35	53.72	90.27	6039	32
90.820877	31.87	64.27	69.65	115.66	6040	32
90.891678	32.40	58.22	56.96	100.25	6043	15
90.962509	39.23	49.57	36.23	83.69	6044	15
90.998947	23.11	92.61	14.06	96.93	175	15
91.033707	48.14	52.18	39.16	90.95	5751	18
91.102776	42.72	66.24	66.48	116.21	6048	18
91.173622	38.38	77.90	52.18	115.69	6061	39
91.244453	40.22	75.14	50.45	108.55	6036	39
91.315292	32.79	110.88	64.02	144.44	6057	22
91.386124	36.22	76.15	66.88	117.86	6058	22
91.456947	34.95	73.48	69.92	119.16	6045	22
91.527756	38.85	75.29	62.80	119.46	6042	32
91.598625	35.13	78.28	67.47	121.41	6043	32
91.669441	35.22	72.22	59.18	114.52	6048	12
91.740288	33.61	66.31	51.16	103.96	6044	12
91.811134	37.94	63.88	48.63	103.97	6052	18
91.881943	41.62	58.28	62.19	107.97	6052	22
91.952789	48.76	53.05	54.92	103.94	6050	22
91.994095	34.47	48.74	77.84	119.43	1009	22
92.028831	52.53	54.27	50.00	101.18	4920	12
92.093056	51.54	62.34	47.25	105.01	6051	12
92.163887	47.38	67.78	35.90	99.11	6058	9

92.234711	45.20	76.93	42.83	108.36	6052	9
92.305557	39.76	53.55	28.06	80.48	6060	6
92.376404	36.77	50.12	26.94	76.06	6053	7
92.447220	31.59	53.46	26.69	75.41	6059	7
92.518044	36.98	55.57	31.18	83.16	6049	7
92.588890	35.98	58.67	29.13	84.69	6046	7
92.659714	38.14	52.60	35.35	84.51	6047	18
92.730598	43.47	62.41	54.99	107.76	6035	18
92.801414	37.37	67.96	54.06	109.00	6042	27
92.872246	34.58	51.30	49.13	92.74	6060	27
92.943100	42.43	63.41	61.49	110.72	6048	18
92.989212	63.89	72.52	96.45	155.09	1830	18
93.023994	44.01	68.53	77.96	125.09	4087	27
93.083344	56.25	95.95	87.35	158.77	6041	27
93.154167	52.03	84.32	78.94	140.91	6059	22
93.224945	43.76	91.04	53.26	124.32	6051	22
93.295883	38.50	89.64	56.33	125.91	6051	18
93.366676	34.40	57.07	47.87	92.02	6060	18
93.437515	30.27	56.16	41.89	85.45	6059	12
93.508354	43.71	85.69	99.90	154.07	6039	15
93.579170	36.27	63.74	60.23	109.67	6048	15
93.650002	37.33	57.62	28.70	83.79	6057	5
93.720871	38.42	60.52	33.49	86.99	6046	5
93.791687	38.87	61.98	43.77	95.90	6052	7
93.862549	34.77	64.26	42.13	96.24	6056	7
93.933388	39.38	65.05	65.64	113.57	6053	15
93.984360	53.13	73.12	59.33	117.53	2665	15
94.019157	34.46	80.22	54.21	118.99	3258	12
94.073608	45.57	71.59	53.00	113.02	6057	12
94.144409	39.79	83.34	53.31	118.04	6049	12
94.215263	37.96	89.44	47.05	120.92	6051	12
94.286125	34.67	76.97	33.97	102.64	6060	6
94.356934	31.80	56.21	30.71	81.66	6053	6
94.427780	30.99	65.96	52.11	105.06	6060	6
94.498611	33.74	63.29	46.40	97.29	6054	6
94.569435	35.45	64.80	35.70	92.94	6055	7
94.640282	34.92	66.55	40.34	97.42	6057	9
94.711136	34.82	59.93	26.81	83.01	6055	9
94.781921	34.84	57.75	29.20	80.72	6046	5
94.852844	32.99	60.14	33.62	83.72	6042	5
94.923637	37.61	57.51	60.60	105.03	6058	15
94.979515	40.16	77.94	52.64	112.79	3489	15
95.014252	44.59	78.87	98.88	148.27	2436	48
95.063873	45.39	86.23	79.69	137.71	6048	48
95.134758	41.70	91.36	62.58	130.87	6046	22
95.205528	39.34	61.54	30.33	88.91	6056	22
95.276375	37.08	51.32	22.17	77.01	6053	9
95.347221	32.02	53.40	22.60	75.51	6060	9
95.418053	31.76	47.77	19.53	69.97	6059	5
95.488899	34.92	50.04	21.46	71.80	6053	5
95.559708	37.48	63.82	57.81	109.61	6050	22
95.630531	37.94	68.28	51.85	111.53	6052	15
95.701408	39.23	74.75	56.72	121.86	6053	15
95.772247	40.61	88.63	50.96	124.57	6053	39
95.843117	38.71	77.59	54.80	122.52	6041	39
95.913925	39.15	73.49	50.08	109.91	6059	15
95.974640	48.13	77.27	45.99	115.32	4317	15
96.009377	33.73	70.63	62.72	109.68	1602	27
96.054169	44.31	89.13	55.92	128.23	6041	27
96.125038	42.60	97.41	57.16	134.20	6049	32
96.195831	40.30	92.91	42.22	123.32	6052	32
96.266655	38.74	56.03	22.80	81.68	6057	6
96.337479	33.33	47.40	18.09	68.74	6054	6
96.408333	31.55	44.75	21.45	68.43	6059	3
96.479164	33.90	47.56	23.05	72.40	6049	3
[illegible]	38.15	50.47	28.07	79.52	6049	3
96.620819	41.10	54.21	25.95	82.81	6054	3
96.695915	27.36	50.02	22.10	69.75	4800	6
96.762497	32.29	62.88	42.75	90.89	6047	5
96.833359	33.66	58.75	35.57	84.49	6052	5
96.904167	36.72	64.69	37.56	92.58	6052	4

96.969795	39.27	59.12	29.70	87.90	5157	4
97.004517	44.79	63.92	32.33	86.25	770	6
97.044434	38.56	59.23	29.97	86.48	6049	6
97.116051	42.24	82.44	40.29	113.62	5903	6
97.186134	39.63	102.28	49.80	133.16	6051	32
97.256943	38.86	92.43	61.51	131.18	6052	12
97.327759	31.86	91.93	51.16	125.08	6053	12
97.398613	29.64	66.14	37.89	94.84	6057	9
97.469444	32.36	54.74	32.17	81.54	6057	9
97.540268	37.39	64.44	39.93	94.05	6050	18
97.611115	36.82	71.05	40.52	98.55	6047	18
97.681946	38.21	84.61	40.44	115.23	6047	111
97.752815	50.32	134.32	127.49	212.29	6027	236
97.823654	66.87	185.43	116.20	259.41	6026	236
97.894386	88.43	203.06	116.11	292.65	5992	236
97.964973	118.18	258.01	165.21	371.70	5978	236
98.034790	116.33	251.59	110.56	328.07	5911	300
98.104836	94.04	155.28	72.71	227.81	6028	300
98.175789	83.81	139.76	68.79	195.74	6026	80
98.246620	79.48	131.02	88.82	200.15	6023	80
98.317398	68.15	122.95	83.04	182.38	6039	80
98.388184	62.84	117.00	56.57	157.75	6053	27
98.459053	55.86	87.47	43.02	130.87	6051	27
98.529846	55.76	82.21	43.18	129.14	6046	27
98.600708	53.53	83.20	33.70	124.15	6051	27
98.671532	53.53	78.36	39.15	124.55	6044	32
98.742409	52.62	81.30	49.55	134.09	6048	32
98.813240	53.71	73.39	50.68	124.73	6047	22
98.884071	52.16	75.19	45.68	120.15	6050	22
98.954964	60.03	76.64	55.14	128.39	6037	22
98.995125	32.27	81.46	30.74	104.38	830	22
99.029877	60.52	64.46	41.42	111.50	5101	9
99.095139	58.52	73.18	47.18	117.70	6057	9
99.165962	55.32	63.13	46.47	109.31	6056	9
99.236687	53.08	69.27	60.70	122.87	6029	9
99.307671	42.43	84.89	60.29	128.53	6037	15
99.378487	39.43	83.59	69.12	131.82	6056	15
99.449303	37.92	52.36	56.05	99.32	6060	15
99.520164	39.64	63.21	60.52	111.14	6040	7
99.590950	41.19	64.27	53.51	109.07	6051	7
99.661819	38.65	59.00	49.27	101.96	6051	6
99.807976	43.34	47.11	58.25	101.31	5290	9
99.874336	40.07	52.65	58.79	105.86	6058	9
99.945175	48.06	54.93	60.27	110.42	6053	12
99.990288	66.23	66.31	73.95	138.68	1663	12
100.025055	41.57	51.38	39.16	86.26	4265	9
100.085419	50.93	66.88	47.51	107.16	6055	9
100.156250	47.43	66.23	39.40	99.03	6059	15
100.227058	45.76	55.14	31.48	85.92	6049	15
100.297920	42.02	39.75	21.24	69.55	6061	9
100.368759	36.48	47.49	32.93	77.50	6056	9
100.439583	33.60	52.25	37.91	82.10	6057	6
100.510414	36.23	55.29	47.98	92.47	6048	18
100.581230	38.58	67.20	47.60	101.46	6045	18
100.652084	35.03	66.88	57.87	107.75	6044	15
100.722939	35.09	59.77	53.65	101.97	6051	15
100.793785	36.73	62.80	42.76	96.52	6051	22
100.864594	39.67	63.66	60.01	111.56	6052	22
100.935440	46.45	67.63	61.49	116.19	6051	22
100.985420	58.89	80.36	53.78	129.72	2489	22
101.020195	46.87	76.14	74.00	130.12	3432	22
101.076843	56.70	80.00	68.41	135.57	5841	22
101.146530	52.45	94.71	71.17	143.53	6063	27
101.217361	43.46	112.63	66.34	149.89	6056	27
101.288193	42.23	88.77	55.75	127.56	6055	22
101.359039	36.88	79.27	60.30	120.69	6047	22
101.429863	32.05	69.85	54.47	105.45	6053	18
101.500664	34.53	51.49	42.21	86.91	6045	15
101.571495	36.50	60.24	40.36	93.25	6046	15
101.642372	37.23	60.13	42.30	95.14	6053	15
101.713203	37.39	55.56	39.04	91.00	6052	15

101.784073	37.09	49.36	36.36	82.99	6049	12
101.854881	37.37	47.18	45.05	86.10	6051	12
101.925720	43.95	61.82	61.62	110.36	6056	18
101.980545	46.21	55.48	46.19	96.71	3316	18
102.015289	42.86	50.97	21.00	78.80	2610	6
102.065971	47.96	58.86	38.75	95.12	6052	6
102.136818	44.00	56.79	32.85	87.59	6062	15
102.207649	44.60	71.35	54.19	110.09	6054	15
102.278481	42.15	64.79	31.65	91.37	6061	18
102.349319	32.06	65.81	48.17	101.31	6057	18
102.420135	29.42	55.35	44.72	85.98	6059	6
102.490974	30.73	55.54	39.79	84.47	6054	6
102.561806	34.17	56.67	44.00	89.68	6048	7
102.632629	34.63	60.80	41.58	91.46	6052	6
102.703491	34.87	53.83	39.23	88.20	6055	6
102.774338	34.81	48.01	40.23	84.39	6053	9
102.845177	36.78	48.39	44.09	87.85	6053	9
102.916008	39.75	47.57	47.45	89.54	6054	5
102.975693	45.60	54.10	44.22	94.10	4141	5
103.010429	35.71	36.36	13.82	58.78	1784	9
103.056252	44.62	63.62	43.84	100.69	6053	9
103.127083	45.25	69.22	49.04	107.20	6061	12
103.197914	43.71	63.23	45.16	97.75	6061	12
103.268776	40.20	68.84	38.22	97.09	6056	9
103.339569	33.69	55.42	27.52	79.97	6052	9
103.410431	30.84	46.98	26.44	70.41	6053	2
103.481262	30.25	47.70	28.39	74.12	6056	2
103.552071	33.67	50.01	23.84	75.03	6049	4
103.622902	34.75	54.90	24.96	78.31	6055	4
103.693764	32.84	46.41	27.69	73.76	6046	6
103.764603	30.23	46.45	27.32	70.56	6053	5
103.835426	31.54	45.06	30.17	70.98	6048	5
103.906273	34.91	43.61	33.46	74.19	6057	6
103.970856	40.37	42.66	35.62	77.58	4975	6
104.005569	46.18	42.67	11.35	67.71	950	9
104.046539	44.45	55.74	46.75	96.28	6038	9
104.117371	48.06	68.21	53.02	109.90	6053	9
104.188210	41.28	66.51	41.03	96.70	6058	22
104.259018	42.31	58.43	29.76	85.10	6056	7
104.329849	34.45	61.89	44.86	96.10	6058	7
104.400703	31.96	52.64	30.95	77.13	6056	4
104.471519	30.42	58.81	30.30	83.73	6053	4
104.542351	33.82	51.64	30.52	80.28	6050	3
104.613182	35.70	55.81	24.36	80.20	6057	3
104.684052	34.26	48.18	24.40	74.41	6054	2
104.754898	30.65	47.87	28.56	71.99	6049	0
104.825729	34.61	43.80	28.03	72.67	6052	0
104.896553	34.82	52.66	31.97	79.56	6059	0
104.966003	37.44	53.45	28.86	80.49	5817	0
105.000710	22.33	88.26	22.09	93.81	117	0
105.036819	34.49	55.85	27.59	80.35	6052	0
105.107635	36.07	61.74	30.20	85.91	6054	0
105.178482	36.73	54.46	27.23	79.12	6055	2
105.249290	33.80	57.99	25.67	81.25	6058	2
105.320137	30.33	46.98	22.58	68.18	6056	2
105.390991	27.93	42.81	24.97	64.47	6054	3
105.461792	29.79	43.37	27.26	67.09	6053	3
105.532623	32.56	49.18	30.77	75.06	6047	2
105.603470	37.41	51.63	27.72	78.49	6052	2
105.674316	34.62	51.60	37.37	83.14	6054	3
105.745140	34.14	51.52	39.74	83.76	6043	3
105.815994	34.35	53.58	32.37	79.66	6050	5
105.886841	32.19	54.71	32.30	79.46	6057	2
105.957642	34.33	59.41	27.54	82.14	6048	2
105.996529	38.22	45.64	16.04	69.38	593	2
106.031265	33.35	62.88	30.82	87.22	5340	2
106.097908	35.19	63.43	34.09	89.69	6054	2
106.168762	35.92	59.82	29.43	84.38	6064	4
106.239586	31.46	54.55	22.10	76.02	6057	4
106.310417	29.13	55.38	24.79	76.96	6063	4
106.381264	28.27	51.31	28.03	74.12	6060	6

106.452072	28.53	49.94	25.27	71.33	6058	6
106.522926	31.50	56.65	29.70	79.03	6042	5
106.593735	38.19	51.75	28.45	79.59	6057	5
106.664597	34.67	59.50	29.25	83.84	6053	6
106.735428	37.95	50.40	31.87	80.87	6050	6
106.806282	38.63	62.49	33.28	91.47	6052	9
106.877098	35.84	64.78	54.99	105.84	6054	12
106.947937	36.00	73.14	62.26	117.83	6053	12
106.991676	44.06	106.61	39.79	134.71	1427	12
107.026459	35.41	78.68	65.03	122.91	4503	18
107.088203	39.32	92.40	64.60	135.83	6049	18
107.159019	39.85	127.57	84.23	173.10	6048	32
107.229851	35.35	100.27	55.68	131.95	6059	32
107.300682	34.58	63.51	36.82	91.92	6052	32
107.371529	37.08	104.05	75.75	150.22	6048	32
107.442360	44.78	93.69	84.47	148.24	6055	32
107.513191	41.21	71.26	52.91	110.93	6047	32
107.584038	46.05	69.38	55.23	117.28	6042	32
107.654877	41.84	62.53	30.35	91.59	6053	12
107.725716	45.28	76.23	33.82	106.96	6049	12
107.796555	43.52	53.59	41.12	94.67	6052	9
107.867409	36.32	69.10	46.12	104.36	6053	9
107.938255	36.65	73.48	43.10	104.64	6040	7
107.986809	50.19	66.09	53.80	111.84	2253	7
108.021576	28.73	65.23	33.37	87.06	3677	15
108.078468	39.31	66.93	58.23	109.96	6053	15
108.149292	36.16	56.51	44.84	94.10	6059	15
108.220139	32.95	50.48	53.57	91.09	6055	15
108.290985	32.08	69.15	54.91	108.84	6055	27
108.361809	32.88	73.29	63.52	116.60	6057	27
108.432648	33.87	45.52	52.06	87.31	6059	12
108.503487	35.39	43.63	51.94	87.65	6054	4
108.575951	43.49	54.57	46.56	95.67	5699	4
108.645126	42.24	62.41	51.02	101.69	6055	7
108.791161	45.33	59.39	52.25	103.79	5315	5
108.857681	38.69	66.15	52.26	104.59	6052	5
108.928520	38.27	53.23	52.30	96.70	6060	7
108.981941	43.58	65.43	57.17	110.46	3080	7
109.016693	32.69	65.26	30.67	90.57	2849	5
109.068764	37.88	64.45	32.61	90.85	6052	5
109.139580	36.66	66.87	33.47	91.54	6063	9
109.210426	35.90	54.90	26.13	80.42	6057	9
109.281235	32.94	42.72	23.16	67.48	6058	4
109.352074	29.67	45.98	32.67	72.79	6060	4
109.422920	29.12	38.87	20.30	60.08	6058	2
109.493752	31.54	41.49	24.99	66.54	6050	2
109.564583	37.07	46.07	25.11	72.67	6055	3
109.635406	38.04	51.03	25.74	76.27	6053	3
109.706253	40.33	54.98	27.62	81.84	6047	3
109.777107	39.79	59.37	45.00	95.48	6047	12
109.847961	33.67	68.37	41.03	98.82	6052	12
109.918770	36.61	62.61	44.60	97.85	6044	6
109.977104	37.17	68.61	54.08	108.51	3898	6
110.011467	35.76	59.96	28.67	84.43	1963	15
110.058319	33.80	71.87	45.27	102.79	6050	15
110.129181	37.04	110.56	83.87	160.29	6061	27
110.199989	35.23	81.10	44.27	109.18	6043	27
110.270813	32.37	57.08	21.41	77.22	6054	6
110.341675	29.99	49.41	24.67	73.08	6060	6
110.412491	30.72	42.89	28.57	68.72	6055	6
110.483353	33.33	54.46	50.82	94.78	6045	6
110.554199	37.76	59.50	65.78	114.26	6031	15
110.625000	35.84	68.17	55.88	110.48	6056	15
110.696358	37.58	63.96	33.53	91.49	5890	15
110.766693	37.70	62.07	48.77	101.41	6053	6
110.837532	33.25	65.00	36.89	92.90	6049	6
110.908394	36.26	61.88	34.19	89.15	6058	6
110.971909	39.28	64.62	41.74	99.52	4790	6
111.006622	26.36	45.09	44.76	75.99	1127	15
111.048615	34.85	71.19	51.55	104.58	6044	15
111.119423	39.34	68.98	57.68	110.25	6058	15

111.190277	36.32	66.08	63.72	113.03	6056	18
111.261101	31.93	55.02	50.65	92.99	6063	18
111.331947	27.13	50.88	66.14	99.87	6060	18
111.402779	27.56	44.39	57.40	86.66	6054	7
111.473602	30.03	51.15	65.63	99.95	6057	7
111.544441	32.58	47.95	59.13	94.16	6051	15
111.615265	33.01	60.33	54.00	99.96	6057	15
111.761757	34.90	83.20	63.24	124.65	5234	9
111.827805	31.28	51.92	55.37	92.96	6056	9
111.898636	33.02	42.16	56.38	89.18	6059	6
111.967033	37.98	48.61	54.86	93.47	5629	6
112.001747	46.15	79.74	18.23	94.28	293	12
112.038864	41.10	54.79	36.87	86.84	6049	12
112.109711	42.03	56.12	37.73	88.30	6054	12
112.180565	38.51	51.04	26.48	75.18	6063	5
112.251366	37.90	45.49	23.47	69.25	6055	3
112.322235	30.70	44.49	24.77	67.36	6060	3
112.393059	27.66	54.55	39.46	81.22	6059	22
112.463890	29.12	53.81	39.17	82.62	6055	22
112.534714	32.48	52.95	29.78	77.81	6047	12
112.605545	33.54	61.66	25.60	82.74	6057	12
112.676414	30.13	45.15	36.69	76.37	6049	12
112.747246	27.76	43.36	29.42	68.86	6048	12
112.818092	29.12	43.45	29.01	69.07	6056	6
112.888908	29.15	51.44	41.57	81.49	6060	5
112.959747	34.89	56.91	36.61	85.28	6054	5
112.997559	25.75	52.90	12.90	65.40	414	5
113.032303	36.96	54.12	52.49	95.40	5516	4
113.099998	38.74	58.08	49.83	96.40	6052	4
113.170845	37.71	55.96	45.24	90.56	6056	6
113.241669	36.69	54.07	47.08	89.00	6058	6
113.312500	30.74	61.34	60.55	104.30	6055	7
113.383347	28.33	43.46	56.77	85.96	6057	7
113.454170	28.01	51.36	54.29	89.36	6058	7
113.525002	30.14	51.33	58.53	92.61	6051	6
113.671989	31.16	50.55	48.79	85.98	5134	3
113.737511	28.03	47.57	57.75	91.25	6045	3
113.808357	28.39	48.20	61.94	95.29	6053	4
113.879204	28.40	57.83	62.83	102.08	6058	4
113.949997	32.28	56.56	54.35	96.15	6050	4
113.992706	31.98	63.74	87.74	119.39	1247	4
114.027489	35.07	53.97	31.83	82.36	4675	4
114.090279	36.39	57.18	30.84	82.93	6057	4
114.161110	35.96	52.17	30.28	78.94	6066	3
114.231918	34.61	47.62	22.23	69.31	6055	3
114.302780	29.37	52.05	25.84	73.65	6064	9
114.373627	26.56	67.11	49.38	98.25	6057	9
114.444435	26.23	44.71	35.99	71.85	6055	7
114.515282	28.33	44.40	32.69	70.75	6050	5
114.586075	33.13	48.86	27.65	73.65	6054	5
114.656944	28.88	55.86	40.26	83.96	6055	7
114.727837	29.05	44.89	44.89	80.51	6038	7
114.798637	28.71	46.88	33.24	71.79	6055	5
114.869492	28.12	51.07	29.61	74.37	6044	5
114.940315	31.28	50.92	33.30	78.27	6046	7
114.987846	44.20	61.28	40.91	97.51	2073	7
115.022614	27.06	52.02	17.27	68.34	3848	6
115.080528	35.24	59.11	29.57	83.66	6048	6
115.151398	34.27	55.76	24.59	77.79	6062	18
115.222221	34.60	67.24	51.67	103.16	6045	18
115.293068	29.44	81.37	55.11	116.46	6054	27
115.363899	25.34	67.63	38.78	90.76	6046	27
115.434677	27.26	68.37	49.83	100.40	6040	27
115.508163	35.36	73.02	85.05	134.82	5255	56
115.576363	38.36	86.35	66.86	136.04	6034	56
115.647232	35.69	67.22	31.96	94.85	6050	15
115.718086	37.20	53.77	36.03	86.73	6046	15
115.788910	38.39	49.12	31.09	82.00	6056	7
115.859741	34.75	56.03	31.67	84.78	6052	7
115.930588	37.83	61.58	40.40	93.08	6056	9
115.982986	42.99	67.19	44.83	102.30	2903	9

116.017731	33.08	69.02	44.39	99.11	3027	6
116.070831	38.14	65.51	50.01	101.64	6057	6
116.141632	36.64	55.79	42.52	90.17	6054	2
116.212479	37.06	46.64	40.67	83.17	6051	2
116.283348	35.17	40.61	43.31	80.76	6061	3
116.425034	28.86	39.57	48.27	79.48	6053	9
116.495834	32.04	47.39	56.12	89.57	6055	9
116.566658	36.90	51.65	50.14	92.00	6051	6
116.637497	35.93	54.44	50.07	93.64	6057	6
116.708366	39.97	51.79	53.27	96.29	6055	6
116.779190	38.12	63.62	53.38	102.82	6051	7
116.850060	33.29	59.13	52.43	98.36	6046	7
116.920868	35.82	61.77	52.21	100.56	6060	4
116.978111	38.64	54.25	52.09	97.13	3731	4
117.012848	35.87	73.75	17.88	85.71	2199	0
117.061089	35.06	66.29	37.00	92.99	6047	0
117.131943	35.62	63.53	28.67	87.24	6061	0
117.202766	36.01	54.32	24.70	79.36	6058	0
117.273598	32.91	45.78	22.29	70.01	6059	4
117.344444	29.03	44.24	21.81	66.48	6056	4
117.415276	28.06	43.44	23.61	64.95	6057	3
117.486115	33.38	48.78	31.97	76.94	6056	3
117.556931	37.29	48.51	25.04	75.51	6055	3
117.627769	37.14	53.15	25.89	77.79	6052	0
117.698624	37.56	62.83	25.96	85.95	6047	0
117.769455	36.04	53.42	36.71	86.94	6058	3
117.840286	32.95	60.49	32.26	86.78	6050	3
117.911133	34.80	61.06	33.55	88.71	6054	3
117.973251	37.89	74.00	44.18	106.35	4559	3
118.007988	22.11	32.31	12.23	43.20	1364	15
118.051376	30.84	73.48	37.48	98.94	6048	15
118.122223	33.67	72.71	29.24	95.44	6061	15
118.193077	33.75	57.45	24.99	80.89	6058	6
118.263878	29.86	50.50	20.58	72.21	6061	7
118.334724	28.71	50.70	24.35	73.11	6063	7
118.405563	29.73	63.50	47.38	96.61	6048	12
118.476379	32.31	73.34	53.19	111.77	6053	12
118.547386	36.33	71.33	51.78	111.65	5992	9
118.618057	38.58	66.22	55.69	112.80	6046	9
118.688911	40.22	81.07	37.44	110.19	6044	15
118.759720	42.20	62.38	30.62	92.68	6042	12
118.830605	29.48	62.98	29.71	84.37	6051	12
118.901421	31.79	54.30	40.67	85.13	6046	27
118.968407	37.08	67.24	60.28	110.36	5385	27
119.003136	45.37	83.21	49.79	110.60	534	39
119.041664	41.37	78.03	78.82	137.38	6034	39
119.112511	39.35	66.79	59.84	111.59	6057	39
119.183342	36.95	93.55	66.76	136.37	6052	18
119.254158	33.53	71.43	52.10	106.01	6057	15
119.324997	28.70	57.06	52.93	94.30	6063	15
119.395836	27.91	70.00	69.05	117.69	6056	9
119.466667	28.20	55.18	55.44	93.54	6056	9
119.537491	30.83	53.32	50.38	88.24	6049	7
119.684212	31.40	56.73	52.74	98.31	5189	7
119.750015	31.27	56.95	59.50	101.42	6050	9
119.820869	30.67	53.00	53.37	94.10	6045	9
119.891678	32.46	55.63	62.46	103.65	6051	9
119.962509	36.85	58.81	52.60	100.23	6048	9
119.998955	18.52	97.93	31.93	107.57	176	9
120.033356	38.62	56.74	39.25	89.04	5696	12
120.102081	40.90	65.92	54.83	106.14	6055	12
120.172905	35.34	73.82	45.81	103.14	6051	12
120.243752	33.94	49.98	25.01	72.19	6049	12
120.314598	27.83	53.88	27.90	74.81	6057	6
120.385437	25.97	43.68	24.37	63.10	6058	9
120.532890	28.11	51.64	43.56	80.82	5058	15
120.597908	30.87	59.21	34.78	83.89	6054	15
120.668762	27.86	48.78	29.68	71.67	6044	12
120.739609	31.48	53.63	48.10	90.49	6049	12
120.810448	30.88	56.02	46.08	89.64	6054	12
120.881287	29.92	52.43	43.30	84.27	6053	22

120.952103	35.01	64.36	44.45	97.27	6053	22
120.993752	27.52	67.55	36.52	91.95	1066	22
121.028496	37.72	65.32	42.96	98.03	4859	15
121.092384	37.43	71.90	57.48	113.15	6045	15
121.163208	37.14	74.49	52.66	109.92	6058	32
121.234032	33.98	66.75	28.44	87.99	6055	32
121.304863	30.16	51.42	24.38	73.28	6059	5
121.375710	26.58	43.47	26.02	63.95	6059	4
121.446541	25.73	40.67	20.33	58.76	6061	4
121.517349	28.78	46.40	27.83	68.76	6048	7
121.588196	31.72	55.11	27.95	77.65	6059	7
121.659042	31.02	62.38	44.84	94.91	6051	9
121.729881	32.30	54.58	47.58	89.99	6045	9
121.800728	32.96	60.14	44.79	94.45	6049	15
121.871559	30.84	57.08	43.77	87.81	6053	15
121.942421	34.00	52.09	32.21	80.23	6056	6
121.988899	53.29	49.72	52.81	103.94	1894	6
122.023643	27.56	54.13	24.80	73.54	4031	6
122.082642	37.28	62.53	37.49	90.94	6056	6
122.153519	39.08	75.15	64.15	121.38	6051	22
122.224297	31.94	75.05	35.68	98.91	6053	22
122.295158	29.02	66.69	37.33	90.93	6054	12
122.365929	24.37	52.43	32.32	74.14	6049	12
122.436333	24.46	46.30	19.40	62.10	4735	15
122.508438	33.03	61.56	46.00	92.37	4878	15
122.578423	31.53	63.33	30.99	84.95	6053	15
122.649284	29.14	69.93	37.03	92.60	6056	18
122.720123	31.68	71.70	43.02	101.08	6043	18
122.790993	32.17	62.77	60.79	107.28	6053	18
122.861816	37.01	60.73	60.81	104.86	6045	18
122.932663	41.99	68.86	47.93	106.33	6059	15
122.984032	45.45	86.13	62.55	129.75	2723	15
123.018761	35.43	70.48	57.10	108.31	3198	18
123.072891	48.65	77.71	61.54	125.17	6051	18
123.143753	45.77	62.10	48.82	103.30	6055	7
123.285393	37.57	73.65	61.93	116.14	6056	7
123.356247	27.67	61.01	65.37	106.31	6054	7
123.427086	30.77	66.00	76.78	121.24	6057	32
123.497894	34.18	80.39	65.84	123.36	6060	32
123.568703	30.35	72.98	66.37	116.21	6049	39
123.639572	27.50	83.58	65.15	122.81	6052	22
123.710426	28.94	65.17	79.71	120.03	6054	22
123.781273	32.88	59.43	78.46	117.34	6050	18
123.852119	35.10	60.72	73.49	115.33	6044	18
123.922951	41.18	68.92	69.75	123.34	6056	22
123.979134	42.83	57.39	72.09	117.65	3552	22
124.013885	46.87	64.19	24.58	88.95	2372	9
124.063187	41.39	67.53	34.94	96.08	6053	9
124.134018	40.61	72.68	32.85	98.25	6063	9
124.204842	38.52	74.75	41.97	102.54	6050	9
124.275703	37.13	75.10	37.77	99.45	6061	12
124.346527	28.47	49.78	23.92	67.95	6060	12
124.417351	25.24	41.83	31.25	65.32	6059	5
124.488152	29.97	46.72	28.10	70.53	6045	5
124.559006	32.32	50.32	25.46	72.55	6055	7
124.629829	31.60	56.11	33.61	82.35	6051	27
124.700722	29.47	55.20	41.84	86.63	6054	27
124.771530	34.17	61.35	62.68	110.40	6048	48
124.842377	34.34	60.50	61.34	109.79	6053	48
124.913216	40.16	62.69	51.74	104.75	6055	22
124.974304	46.32	65.51	50.33	107.50	4382	22
125.009041	32.21	45.95	28.05	71.08	1544	5
125.053459	40.10	65.65	37.72	94.53	6050	5
125.124283	41.25	59.90	32.16	88.46	6061	5
125.195137	39.24	48.51	25.46	74.29	6063	5
125.265945	37.82	51.98	28.28	76.94	6061	6
125.336830	30.64	46.97	25.64	69.22	6053	6
125.407639	27.75	47.56	28.19	70.18	6053	9
125.478462	29.29	55.68	40.49	85.45	6056	9
125.549278	30.97	64.27	41.51	91.68	6053	6
125.620140	31.12	64.11	42.68	92.76	6047	6

125.690971	29.48	50.81	28.54	74.53	6052	6
125.761818	27.09	48.05	32.74	73.45	6054	7
125.832664	29.97	48.30	38.23	77.65	6055	7
125.903481	37.47	51.34	58.31	96.38	6053	7
125.969467	41.18	56.49	55.21	99.56	5215	7
126.004181	52.59	62.38	18.44	85.10	711	7
126.043762	42.27	55.40	32.76	85.80	6051	7
126.114571	46.51	64.33	37.29	96.31	6051	7
126.185417	40.89	70.03	42.54	101.91	6058	7
126.256226	42.35	80.05	53.64	118.23	6054	18
126.327072	31.66	54.38	33.06	80.11	6054	18
126.397903	30.14	53.99	37.97	80.01	6051	7
126.468727	31.71	60.45	55.67	96.92	6048	7
126.539528	32.45	58.36	56.08	98.69	6044	12
126.610397	30.32	64.98	44.84	95.14	6050	12
126.681236	30.71	51.70	27.29	74.76	6044	5
126.752083	27.37	49.03	33.34	73.12	6051	7
126.822937	29.66	51.49	32.13	76.82	6054	7
126.893753	34.68	43.11	40.11	77.13	6054	15
126.964592	41.69	47.70	37.45	82.08	6049	15
127.034737	48.98	62.76	66.87	117.17	5932	18
127.104836	48.49	80.96	65.64	131.77	6050	18
127.175682	38.71	103.04	65.36	142.53	6055	18
127.246513	39.75	74.47	38.35	100.97	6060	18
127.317352	34.21	58.93	32.48	83.78	6059	6
127.388191	30.95	47.88	35.36	75.25	6048	6
127.459015	30.90	51.45	31.43	76.15	6062	6
127.529846	32.12	57.70	42.20	86.52	6053	9
127.600685	32.02	62.14	42.09	90.65	6057	9
127.671516	29.27	51.70	26.83	73.72	6051	7
127.742371	26.71	43.84	34.04	70.05	6043	7
127.813210	27.92	44.97	38.77	75.44	6051	6
127.884048	31.29	47.63	44.23	82.41	6056	15
127.954865	38.53	50.67	49.71	90.55	6055	15
127.995125	24.34	39.47	48.89	75.85	831	15
128.029526	45.11	72.39	61.04	117.81	5039	7
128.094452	41.98	71.05	50.90	110.71	6050	7
128.165253	39.12	70.67	47.70	106.35	6053	7
128.236099	36.02	72.63	32.92	96.04	6053	7
128.306946	32.24	54.84	28.46	77.23	6060	6
128.377762	27.30	41.16	26.11	62.73	6059	4
128.448608	27.06	44.63	24.93	64.99	6059	4
128.519440	31.64	47.55	28.38	71.59	6055	4
128.590271	31.51	49.69	25.91	71.93	6050	4
128.661118	29.17	63.38	31.65	85.41	6041	2
128.731995	25.48	45.99	40.52	74.76	6023	2
128.802795	24.52	46.55	42.70	77.81	6052	6
128.876083	23.80	46.38	31.75	69.41	5454	4
128.944473	32.71	53.76	35.09	82.01	6053	4
128.989929	46.97	54.06	52.79	98.63	1722	4
129.024689	31.19	49.95	24.63	72.77	4209	3
129.084702	36.52	55.25	33.06	83.47	6053	3
129.155563	36.04	59.33	32.46	84.66	6061	0
129.226395	34.09	48.29	24.41	70.79	6059	0
129.297226	28.98	49.05	27.24	70.62	6063	3
129.368027	24.26	47.22	24.73	65.02	6055	3
129.438873	24.46	47.41	23.89	64.47	6056	3
129.509705	27.47	48.75	26.04	68.23	6059	4
129.580536	28.79	50.73	28.15	72.46	6053	4
129.651398	27.82	59.81	29.96	80.00	6052	4
129.722244	25.53	45.71	33.04	70.26	6044	4
129.793076	25.25	45.55	36.72	72.00	6045	6
129.863922	25.34	48.22	33.12	72.37	6057	6
129.934738	30.82	51.42	35.41	79.05	6054	7
129.985077	38.92	52.10	59.22	97.66	2551	7
130.019821	28.00	53.23	16.60	69.71	3371	5
130.074982	34.16	59.09	38.15	87.67	6046	5
130.145828	32.97	59.20	44.48	91.76	6061	9
130.216660	31.14	70.02	34.43	92.77	6057	9
130.287506	27.99	57.57	27.06	76.99	6060	4
130.358337	22.36	62.09	35.17	84.01	6061	4

130.429153	23.11	49.78	38.35	75.80	6057	6
130.499969	26.22	58.56	39.50	82.75	6049	6
130.570831	27.60	53.91	38.38	82.29	6046	6
130.641647	27.88	54.06	35.52	79.32	6047	12
130.712509	30.02	56.12	49.03	91.19	6047	12
130.783340	29.07	62.46	52.82	98.93	6054	12
130.854187	24.59	59.27	47.11	88.80	6052	12
130.925018	30.94	57.99	48.06	92.05	6060	9
130.980194	32.89	67.02	47.89	100.40	3375	9
131.014938	35.99	67.70	43.80	99.31	2553	12
131.065262	34.45	79.77	46.73	109.06	6053	12
131.136108	34.81	82.03	55.65	120.03	6062	9
131.206955	31.67	65.77	31.15	87.13	6056	9
131.277771	31.07	61.03	29.00	82.81	6061	4
131.348618	24.06	52.08	29.58	71.57	6057	4
131.419449	23.31	50.61	36.22	75.58	6054	3
131.490265	25.42	53.03	39.96	80.52	6055	3
131.561081	29.34	55.74	34.07	80.58	6050	5
131.631927	28.60	53.44	36.15	80.27	6050	4
131.702789	30.23	52.64	34.07	79.58	6053	4
131.773621	31.41	47.50	35.25	77.33	6052	4
131.844467	29.05	48.08	37.11	77.99	6053	4
131.915283	30.10	57.87	37.80	84.81	6045	5
131.975327	35.38	71.13	46.60	101.27	4205	5
132.010086	26.78	35.50	43.10	70.28	1723	5
132.055557	32.07	71.54	53.14	106.55	6053	5
132.126373	32.62	76.55	54.78	113.64	6058	5
132.197250	30.78	66.03	46.36	96.69	6050	5
132.268051	29.50	68.28	54.45	106.47	6063	5
132.338882	22.89	51.78	47.47	83.59	6060	5
132.409714	21.48	46.41	54.72	83.19	6057	2
132.557068	27.52	53.59	45.09	85.14	5075	5
132.622208	29.75	56.65	52.36	94.07	6048	5
132.693085	29.86	50.33	54.15	89.90	6052	2
132.763885	29.90	51.41	55.32	92.59	6049	3
132.834717	28.21	50.99	51.24	88.26	6043	3
132.905563	30.14	50.20	58.53	96.24	6055	7
132.970474	33.91	56.40	55.56	98.63	5037	7
133.005203	45.91	33.85	12.79	62.30	891	7
133.045837	34.32	60.25	38.79	88.60	6049	7
133.116653	36.81	73.03	48.32	107.95	6057	7
133.187500	34.29	83.68	73.99	130.43	6059	18
133.258301	38.34	78.33	61.70	119.11	6056	27
133.329163	31.01	83.04	60.35	119.74	6055	27
133.400040	27.94	81.52	81.20	132.75	6042	15
133.470795	26.69	54.75	55.77	92.80	6051	15
133.541626	28.11	58.84	53.00	94.35	6052	7
133.612488	29.23	56.04	38.81	83.90	6047	7
133.683334	26.69	48.89	35.21	75.35	6048	4
133.754181	26.22	43.61	30.02	66.39	6046	12
133.825073	26.17	61.38	54.29	97.39	6047	12
133.895874	28.32	56.75	62.23	100.43	6053	27
133.965591	32.09	66.70	57.02	106.35	5862	27
134.000366	35.93	95.91	27.09	106.00	57	27
134.036102	36.43	77.24	79.35	132.19	6045	27
134.120514	37.71	68.98	39.22	98.75	3545	27
134.177795	34.37	54.88	32.52	79.84	6063	7
134.248718	36.25	52.17	21.60	73.23	6039	7
134.319427	30.69	45.68	21.02	65.22	6060	7
134.390289	27.21	43.54	33.41	69.50	6056	9
134.461105	27.01	46.39	25.72	67.01	6055	9
134.531967	29.94	48.82	35.02	75.48	6046	18
134.602783	33.32	55.88	29.67	79.51	6047	18
134.673630	35.21	73.81	33.12	100.01	6049	22
134.744461	25.68	47.85	69.22	102.72	6049	22
134.816147	24.37	60.22	47.88	91.83	5831	15
134.886154	24.51	57.89	46.58	87.59	6049	7
134.956970	30.23	53.88	37.30	82.13	6057	7
134.996185	18.94	40.49	14.34	51.82	650	7
135.030914	34.48	59.99	33.72	85.79	5280	22
135.097214	41.15	67.45	53.79	106.65	6050	22

135.168060	31.90	64.45	30.71	86.55	6060	9
135.238846	32.63	45.23	24.66	67.27	6053	9
135.309708	27.17	43.48	22.43	63.41	6057	5
135.380569	24.39	50.74	35.03	74.98	6060	5
135.451401	24.34	62.06	44.17	90.32	6049	5
135.522217	26.28	64.36	48.73	95.03	6049	6
135.593048	27.09	57.81	41.61	85.83	6055	6
135.663895	26.11	56.81	41.43	83.96	6052	5
135.734726	24.15	44.65	41.80	76.71	6046	5
135.805573	28.07	51.67	48.85	86.70	6056	12
135.876419	30.34	50.65	57.96	94.47	6054	6
135.947250	43.24	49.90	83.62	118.24	6059	6
135.991302	47.28	65.20	142.85	178.96	1484	6
136.026077	55.56	66.94	86.85	137.64	4446	32
136.087494	59.17	88.38	110.62	175.17	6052	32
136.158325	48.33	82.47	99.39	152.49	6057	12
136.229172	45.11	66.53	93.40	138.18	6053	12
136.300003	44.60	69.56	93.19	140.51	6062	9
136.370499	39.96	83.05	99.09	151.95	6002	9
136.444183	47.97	89.07	109.86	168.59	4876	12
136.512497	56.99	103.55	110.62	179.00	6055	7
136.583328	55.71	85.52	118.99	172.17	6054	7
136.654175	60.43	97.37	131.82	191.09	6046	9
136.725006	53.55	76.21	131.62	171.97	6051	9
136.795837	33.42	60.45	67.22	107.91	6057	6
136.866684	29.68	51.50	68.40	100.40	6055	6
136.937515	34.91	61.71	62.58	103.67	6056	9
136.986435	37.67	52.01	74.94	111.17	2314	9
137.020874	40.39	57.23	48.92	94.64	3556	12
137.077072	41.02	73.00	48.09	112.48	6052	12
137.147903	39.58	114.87	76.26	162.23	6061	32
137.218735	38.05	85.22	40.29	115.48	6055	32
137.289566	37.76	56.92	25.98	84.42	6058	15
137.360428	31.03	70.67	60.19	110.00	6054	15
137.431259	31.15	64.50	63.41	108.02	6052	15
137.501953	32.99	64.02	53.71	100.85	6031	12
137.573090	36.03	65.99	42.23	97.11	6013	12
137.643738	29.56	52.84	35.09	78.52	6056	12
137.718307	21.41	43.51	23.47	61.00	4946	12
137.786819	24.00	54.79	41.93	83.51	5686	15
137.856247	25.12	62.17	52.25	96.19	6048	15
137.927124	30.36	63.63	53.73	99.86	6055	15
137.981232	33.30	62.10	69.73	110.42	3196	15
138.015991	34.14	63.72	37.68	91.26	2731	80
138.067368	47.06	105.55	93.50	169.76	6048	80
138.138199	54.75	129.44	100.48	195.69	6052	80
138.209045	48.20	107.38	80.94	159.35	6045	80
138.279846	44.58	72.76	35.94	100.88	6059	18
138.350708	34.43	47.97	32.10	76.77	6050	18
138.421509	30.95	45.63	25.86	69.47	6057	9
138.492355	34.16	47.14	39.68	80.35	6053	9
138.563156	35.25	62.20	24.66	84.05	6051	6
138.634018	35.04	55.19	27.75	79.58	6051	4
138.704880	35.40	54.46	30.36	82.00	6052	4
138.775711	32.49	51.39	32.83	80.76	6054	12
138.846558	33.17	65.62	50.85	101.36	6053	12
138.917404	32.88	68.74	45.34	99.16	6056	15
138.976379	36.23	81.68	65.28	122.79	4023	15
139.011124	35.37	54.57	22.84	77.98	1903	18
139.057648	35.87	72.66	43.80	102.46	6051	18
139.128510	39.02	81.64	40.02	110.74	6055	9
139.199310	38.33	53.67	26.63	77.81	6061	9
139.270126	37.83	61.77	32.41	87.23	6063	6
139.340988	30.35	55.55	36.96	84.16	6049	6
139.411789	27.57	49.79	38.81	78.39	6053	6
139.482635	29.70	39.68	34.08	67.77	6053	6
139.553467	32.30	42.97	25.16	67.54	6056	4
139.624313	32.59	56.06	22.55	74.96	6050	4
139.695145	28.58	61.81	33.12	83.93	6044	3
139.765991	29.24	51.63	33.69	77.17	6055	3
139.841660	22.74	42.32	19.30	56.86	4739	3

139.907669	32.14	55.89	44.79	89.01	6046	5
139.971558	38.19	63.36	48.59	102.79	4848	5
140.006256	44.89	38.11	13.59	63.26	1070	7
140.047913	40.60	63.02	57.21	108.57	6047	7
140.118744	42.89	58.37	48.53	99.71	6053	7
140.189606	41.82	50.59	35.22	82.91	6051	7
140.260406	40.19	46.14	21.89	70.44	6062	7
140.331268	33.89	45.14	21.74	67.46	6048	7
140.402115	31.65	56.64	45.70	90.30	6044	9
140.472900	30.62	46.97	29.64	72.28	6056	9
140.539597	28.60	51.96	34.76	77.47	5345	9
140.620041	32.87	62.02	30.11	83.89	5114	9
140.685440	31.32	48.04	26.38	71.55	6055	6
140.756256	27.20	44.82	32.69	70.83	6047	5
140.827118	28.67	42.71	30.58	68.14	6051	5
140.897934	32.94	44.91	36.36	75.39	6059	5
140.966721	41.42	45.56	32.52	78.98	5693	5
141.001404	50.13	81.38	25.04	99.06	235	4
141.038177	41.03	56.13	35.81	86.92	6044	4
141.109024	45.51	54.46	40.91	90.98	6053	4
141.179871	44.24	52.39	50.10	93.70	6060	3
141.250687	45.29	58.66	43.04	94.54	6061	4
141.321533	39.71	48.73	37.84	80.61	6058	4
141.392365	34.33	44.26	30.07	71.21	6058	3
141.463196	30.20	53.53	34.35	80.36	6055	3
141.534027	30.46	61.19	38.52	87.77	6045	4
141.604843	31.38	54.08	37.47	82.09	6057	4
141.675705	26.74	44.97	43.67	80.00	6048	4
141.746567	22.60	43.42	40.21	72.86	6050	4
141.817383	25.31	56.38	42.94	85.26	6050	9
141.888229	27.10	61.65	43.85	89.45	6053	5
141.959061	33.60	55.73	42.90	86.77	6051	5
141.997208	18.56	46.92	13.70	56.74	473	5
142.031952	38.87	78.80	58.78	118.72	5455	6
142.099289	37.78	62.06	44.67	97.07	6056	6
142.170120	35.11	54.82	31.37	80.64	6059	7
142.240982	35.41	66.62	44.58	96.32	6052	7
142.311798	32.26	48.38	20.52	68.13	6055	6
142.382645	27.19	48.52	27.65	70.36	6059	4
142.453461	25.10	42.48	19.30	59.42	6056	4
142.524307	30.28	45.30	27.98	69.12	6053	4
142.595123	30.59	48.28	22.53	68.29	6057	4
142.666000	26.46	50.61	32.72	74.24	6049	5
142.736816	25.90	51.91	32.31	74.23	6047	5
142.807663	24.32	50.24	46.04	82.48	6057	4
142.878494	26.56	53.33	55.64	93.36	6058	7
142.949341	29.89	62.35	49.99	97.44	6057	7
142.992355	25.61	60.12	66.87	103.99	1307	7
143.027115	35.16	54.51	38.53	86.94	4627	5
143.089569	34.27	59.62	46.67	94.82	6053	5
143.160431	31.37	54.39	49.47	90.21	6062	9
143.231232	30.67	56.45	61.45	99.42	6052	9
143.302078	26.74	49.14	82.78	111.15	6057	7
143.372910	21.95	55.02	87.05	117.19	6056	7
143.443741	24.34	66.91	103.49	139.05	6052	12
143.514572	26.47	57.63	99.22	129.73	6042	7
143.585388	33.72	54.61	105.00	133.62	6053	7
143.656250	33.64	45.79	83.44	110.11	6050	5
143.802216	36.52	66.85	76.08	121.24	5317	9
143.868759	29.71	56.13	72.31	105.76	6055	9
143.939606	32.76	54.03	74.10	107.86	6054	7
143.987488	35.45	63.97	74.10	115.84	2137	7
144.022263	35.41	55.82	54.72	94.29	3793	6
144.079865	38.58	58.09	48.89	95.58	6057	6
144.150711	34.15	60.60	51.85	96.84	6063	9
144.221527	33.18	55.28	55.57	94.61	6060	9
144.292343	34.00	48.69	58.25	91.91	6060	9
144.363190	26.78	54.72	75.33	105.52	6056	9
144.434036	27.12	49.46	68.45	98.21	6059	6
144.504868	30.85	50.60	54.09	88.71	6053	7
144.575699	36.08	53.06	63.04	99.38	6050	7

144.646530	32.51	49.91	55.62	90.48	6049	18
144.792511	31.74	71.85	91.91	132.78	5318	111
144.859100	28.27	74.84	78.56	123.15	6038	111
144.929901	33.58	75.36	87.17	135.38	6039	67
144.982620	38.69	103.09	100.32	166.99	2940	67
145.017059	48.87	125.88	109.76	191.93	2897	207
145.069427	42.32	123.81	106.01	188.18	6040	207
145.140213	52.41	224.76	223.00	352.29	5998	179
145.211166	50.82	142.26	83.99	187.79	6037	179
145.281937	47.92	104.09	82.11	158.37	6056	80
145.352783	40.54	168.66	114.82	227.11	6039	80
145.423630	40.93	103.30	102.80	168.75	6050	67
145.494431	38.32	88.93	89.45	148.34	6052	67
145.565262	43.67	74.24	63.87	123.30	6057	48
145.636093	46.78	63.29	36.88	100.67	6053	48
145.706970	48.97	75.33	50.27	119.92	6050	48
145.777786	53.55	88.91	68.00	144.56	6045	80
145.848633	43.21	69.94	52.71	115.71	6051	80
145.919495	43.18	77.72	46.07	111.44	6057	32
145.977417	41.39	76.69	32.96	103.98	3844	32
146.012161	57.53	116.05	63.89	158.09	2079	39
146.059723	47.55	95.64	71.63	147.89	6049	39
146.125595	46.27	103.47	69.51	154.81	5203	39
146.201416	39.49	98.45	53.48	133.61	6044	39
146.272217	36.84	100.97	59.16	138.35	6061	27
146.343063	34.90	91.40	76.17	137.58	6060	27
146.413864	32.96	80.19	57.55	117.42	6051	27
146.484711	36.04	67.96	49.99	103.30	6052	27
146.555542	37.70	73.52	49.55	110.99	6052	15
146.626358	40.12	63.05	49.23	105.70	6044	22
146.697250	43.08	68.31	58.26	114.05	6053	22
146.768097	42.74	58.65	54.33	104.12	6053	27
146.838928	41.52	61.68	48.25	102.76	6052	27
146.909760	39.99	68.40	45.19	102.76	6054	27
146.972580	51.88	73.20	74.81	134.81	4680	27
147.007309	39.01	65.78	8.82	78.80	1248	15
147.050003	44.22	85.26	50.74	121.94	6051	15
147.120819	42.29	90.00	56.56	128.78	6060	15
147.191696	36.67	92.71	52.68	125.47	6057	18
147.260590	35.97	62.08	36.72	90.07	5674	18
147.333328	34.08	76.15	56.22	113.12	6058	18
147.404160	34.56	70.75	69.81	118.11	6053	18
147.474976	34.64	59.61	47.10	95.05	6054	18
147.545807	36.25	55.89	46.87	91.73	6051	9
147.616638	38.85	58.43	43.63	95.14	6057	9
147.687500	41.55	54.34	38.52	90.89	6053	22
147.758331	36.90	51.26	38.16	85.18	6044	18
147.829163	36.47	44.92	24.00	71.60	6050	18
147.899994	37.83	47.36	24.15	74.10	6057	2
147.967697	41.45	48.24	35.63	82.84	5512	2
148.002426	64.27	72.97	26.43	102.24	413	7
148.040253	45.11	56.10	30.19	88.03	6049	7
148.111084	45.22	58.50	25.57	88.81	6050	7
148.181946	39.61	64.20	28.78	90.15	6056	6
148.252762	41.75	57.81	31.14	88.43	6057	5
148.323593	34.71	61.28	29.96	87.45	6062	5
148.394440	29.81	64.00	46.34	96.60	6053	6
148.465271	31.33	51.30	43.13	84.86	6058	6
148.536102	34.45	52.01	35.18	81.05	6043	9
148.606903	36.78	54.00	37.57	87.56	6047	9
148.677780	39.24	55.82	37.71	89.55	6046	12
148.748627	35.43	48.09	42.11	84.59	6050	12
148.819473	35.71	52.06	31.28	80.55	6050	9
148.890289	40.08	63.16	44.12	97.78	6058	12
148.961105	44.30	59.92	34.21	90.86	6048	12
148.998245	24.11	89.96	24.77	97.20	296	12
149.033005	43.47	54.77	32.41	89.58	5631	5
149.101379	44.96	62.91	31.95	96.14	6049	5
149.172241	38.92	53.80	33.69	85.32	6061	6
149.243027	39.96	67.95	44.29	103.64	6056	6
149.313873	34.07	56.86	32.35	84.42	6061	7

149.384720	30.40	45.09	32.33	72.13	6060	9
149.455551	30.12	45.52	43.01	78.91	6061	9
149.526367	33.84	53.07	53.70	95.06	6048	9
149.597198	33.78	53.28	36.30	82.98	6053	9
149.668045	35.71	58.21	30.29	85.80	6049	12
149.738892	33.80	50.46	42.22	84.72	6048	12
149.809723	36.36	56.53	37.99	89.30	6051	12
149.880569	37.18	66.92	50.70	104.93	6048	12
149.951401	43.59	63.07	53.99	105.13	6057	12
149.993393	37.85	68.49	34.57	94.22	1128	12
150.028152	44.26	70.23	43.43	104.49	4805	7
150.091644	43.07	68.89	34.22	97.56	6052	7
150.162506	37.60	60.20	47.89	100.84	6064	15
150.233307	36.09	78.53	57.64	116.78	6052	15
150.304153	35.14	65.03	51.96	105.82	6063	9
150.375000	28.91	55.44	38.54	83.14	6060	9
150.445816	27.61	52.39	32.19	76.32	6054	9
150.516663	33.28	47.16	28.45	73.89	6050	22
150.587479	35.76	56.97	26.80	83.83	6053	22
150.658325	31.87	66.55	52.86	103.27	6047	39
150.729218	33.81	68.97	63.46	117.50	6033	39
150.800034	31.77	56.49	51.41	98.83	6048	48
150.870895	37.71	72.59	50.81	109.75	6048	48
150.941681	39.94	71.96	59.13	118.62	6059	39
150.988510	54.45	102.47	57.69	144.23	1948	39
151.023300	36.57	70.95	70.81	120.36	3971	32
151.081955	45.58	108.36	78.92	166.09	6047	32
151.152771	38.01	69.08	63.72	114.76	6063	12
151.223587	40.95	76.47	70.95	125.75	6052	12
151.294464	40.10	81.41	76.14	130.52	6054	32
151.365265	31.00	58.63	62.24	101.85	6062	32
151.436111	28.21	59.46	74.23	110.55	6060	18
151.506927	31.75	70.59	73.15	119.56	6059	22
151.577805	27.24	63.27	71.81	117.31	6042	22
151.648605	27.78	65.02	69.64	112.80	6049	22
151.794724	32.18	51.36	59.88	96.76	5291	15
151.861130	32.09	68.72	57.16	105.80	6054	15
151.931976	36.84	72.72	60.07	116.24	6052	22
151.983658	40.93	74.51	62.01	116.97	2785	22
152.018097	33.18	57.69	34.55	85.42	3082	12
152.071533	37.22	72.86	40.90	101.39	6054	12
152.142349	37.70	78.97	56.71	118.55	6059	27
152.213211	31.83	70.21	41.24	96.96	6053	27
152.284012	30.57	58.86	30.44	80.18	6063	9
152.354874	26.04	47.41	27.55	68.07	6060	9
152.425690	23.34	38.07	28.02	60.84	6052	4
152.496521	26.50	43.00	26.98	63.87	6055	4
152.567322	33.26	49.11	27.73	72.15	6052	4
152.638168	30.68	47.94	26.50	69.83	6058	4
152.709015	29.57	53.91	29.54	78.04	6048	4
152.779877	28.16	45.48	35.19	72.56	6053	6
152.850708	29.21	49.98	35.25	77.07	6048	6
152.921555	31.96	51.94	34.36	80.73	6049	12
152.978455	34.97	71.66	45.74	100.75	3672	12
153.013214	41.59	60.39	38.89	91.53	2257	15
153.061798	37.21	68.55	40.96	98.18	6050	15
153.132645	36.48	85.88	45.41	114.96	6059	15
153.203476	28.19	86.29	53.80	118.74	6061	15
153.274277	31.37	73.69	37.23	97.81	6059	12
153.345123	25.10	44.30	32.87	68.61	6056	12
153.415955	23.96	38.28	21.46	56.06	6059	3
153.486801	26.93	42.76	24.26	62.58	6053	3
153.557617	29.00	47.26	31.84	71.06	6051	6
153.628403	29.87	57.70	34.20	81.00	6048	4
153.699356	29.25	50.68	27.88	72.83	6042	4
153.770157	27.28	48.02	33.04	72.60	6045	3
153.840988	28.87	45.67	28.29	68.21	6052	3
153.911835	32.45	48.05	34.74	75.59	6060	9
153.973602	40.42	57.64	42.64	93.45	4503	9
154.008331	33.92	31.36	52.29	79.07	1424	6
154.052078	38.49	66.48	46.89	101.80	6053	6

154.122864	41.25	61.31	47.26	98.92	6054	6
154.193756	35.48	61.39	50.62	99.09	6054	7
154.264572	35.46	53.38	51.23	92.41	6062	9
154.335419	27.71	43.64	56.73	84.39	6053	9
154.406250	25.51	40.16	48.47	76.08	6059	4
154.553604	28.65	63.19	58.91	102.21	5078	4
154.618729	29.50	54.17	55.23	93.96	6054	4
154.693802	23.01	37.87	53.51	79.68	4761	4
154.760437	25.34	44.08	53.83	85.58	6050	7
154.831284	27.03	47.31	51.84	87.15	6054	7
154.902115	31.49	49.72	58.13	97.17	6057	7
154.968796	36.08	52.18	53.53	96.76	5330	7
155.003479	50.44	51.70	36.89	84.36	592	12
155.042358	38.03	65.96	54.15	104.93	6053	12
155.113235	41.75	98.07	70.71	147.19	6041	12
155.193176	30.60	72.27	48.24	100.73	4381	7
155.254837	33.81	52.78	52.94	90.44	6056	9
155.325684	28.72	49.41	49.15	83.97	6062	9
155.396545	25.09	59.09	64.45	102.18	6053	18
155.467346	32.40	76.14	83.94	131.25	6050	18
155.538193	26.82	69.57	64.25	111.19	6051	15
155.685028	30.74	58.09	59.04	100.65	5172	6
155.750717	27.93	47.57	58.27	91.27	6048	15
155.821548	30.14	55.57	55.89	98.07	6055	15
155.892380	31.41	54.43	60.86	101.52	6055	7
155.963211	39.19	53.81	53.91	98.70	6054	7
155.999313	18.57	85.41	18.34	89.84	119	7
156.034042	41.19	54.86	31.39	85.07	5809	4
156.103455	41.53	63.12	35.62	92.15	6055	4
156.174316	35.37	55.47	33.00	80.87	6060	6
156.245132	34.21	50.90	30.93	75.83	6059	6
156.315964	29.25	48.77	32.28	75.07	6062	12
156.386810	26.11	39.95	20.01	57.65	6061	2
156.457642	24.49	41.27	21.12	57.94	6060	2
156.528458	28.14	47.39	23.23	65.96	6040	3
156.599289	30.67	48.96	24.96	70.12	6054	3
156.670135	27.48	61.43	30.51	81.30	6053	15
156.741013	25.90	62.08	39.78	86.07	6045	15
156.811844	28.39	48.41	39.61	78.99	6046	32
156.882660	31.11	50.27	59.42	96.16	6049	22
156.953506	37.78	71.51	59.85	110.90	6052	22
156.994431	28.81	59.16	63.82	110.95	948	22
157.029175	45.11	91.06	69.96	141.20	4982	27
157.093796	39.10	83.92	64.40	128.60	6037	27
157.164612	33.51	93.09	62.34	127.60	6060	15
157.235428	31.29	100.69	66.40	138.45	6053	15
157.306274	25.29	80.53	48.33	107.38	6051	27
157.377106	26.25	59.62	58.47	96.92	6053	18
157.447922	28.51	72.05	64.00	113.05	6050	18
157.518723	34.59	75.26	107.57	155.39	6039	39
157.589554	28.61	65.74	39.51	90.16	6051	39
157.660400	27.61	58.31	34.82	82.79	6045	15
157.731277	25.66	56.35	36.23	80.17	6051	15
157.802109	28.27	54.15	37.47	80.72	6049	27
157.872955	29.23	51.22	41.33	81.63	6054	27
157.943817	30.65	61.07	41.23	91.93	6039	27
157.989548	42.65	119.97	87.45	169.02	1774	27
158.024368	31.49	57.77	39.10	88.98	4149	15
158.084045	34.68	74.30	40.74	103.68	6054	15
158.160355	34.23	67.60	40.04	94.00	5075	9
158.225677	30.81	57.35	25.66	76.06	6054	9
158.296509	28.30	51.21	23.21	70.33	6057	9
158.367371	21.21	50.91	36.22	74.11	6056	9
158.438202	23.84	56.21	45.90	88.92	6058	12
158.509018	24.44	64.00	49.90	94.94	6046	18
158.579865	27.70	54.77	36.46	81.14	6056	18
158.650681	23.39	57.88	36.16	81.69	6051	48
158.721558	26.03	56.03	35.04	81.13	6047	48
158.792389	29.49	58.52	35.34	83.60	6049	6
158.863235	27.23	49.57	34.63	75.92	6046	6
158.934052	29.61	53.64	37.43	82.80	6059	5

158.984711	37.56	67.13	62.66	108.78	2607	5
159.019135	27.62	60.99	21.67	76.29	3260	6
159.073624	33.54	61.18	34.53	86.10	6051	6
159.144455	33.33	55.29	29.78	79.74	6057	5
159.215271	36.73	46.48	28.17	74.13	6056	5
159.286118	35.49	53.73	21.33	74.04	6060	9
159.356949	28.64	73.82	52.03	106.82	6053	9
159.427780	26.19	47.25	32.03	70.44	6059	12
159.498596	27.31	43.20	29.83	67.41	6054	12
159.569427	30.18	52.35	23.49	70.71	6057	12
159.640259	29.16	57.47	29.73	77.97	6055	12
159.711136	26.58	49.71	33.17	74.83	6055	12
159.781952	23.56	47.64	50.09	83.95	6044	12
159.852814	26.93	66.10	53.41	102.02	6044	12
159.923630	34.94	74.90	54.92	113.05	6053	22
159.979507	35.99	75.96	52.24	109.49	3492	22
160.014252	49.51	81.12	49.09	116.15	2438	12
160.063858	36.48	65.60	54.77	106.14	6047	12
160.134979	35.33	65.37	70.17	115.45	5937	22
160.205551	31.83	90.07	65.28	130.38	6060	22
160.276382	37.51	87.65	72.93	135.75	6054	32
160.347229	24.60	54.80	64.54	97.53	6056	32
160.418167	27.84	82.17	106.43	152.29	6007	94
160.488953	31.48	91.43	100.67	154.07	6027	94
160.636047	50.35	110.50	151.13	218.30	5106	94
160.701569	41.52	90.38	93.77	164.78	5988	94
160.772263	41.32	105.19	90.98	163.38	6045	80
160.843109	43.58	88.93	73.30	141.08	6050	80
160.913925	44.66	77.83	66.69	130.27	6057	48
160.974655	53.59	64.80	56.23	116.45	4327	48
161.009369	31.92	58.09	24.42	76.53	1606	3
161.054169	47.50	62.85	35.33	95.10	6054	3
161.125000	51.01	64.85	30.82	95.87	6064	5
161.195816	44.64	52.65	27.46	80.57	6059	5
161.266663	44.21	47.86	24.89	75.95	6062	5
161.337509	35.62	48.57	30.05	75.00	6047	5
161.408325	31.27	42.57	26.83	65.98	6054	9
161.479156	30.24	44.67	28.68	69.38	6053	9
161.550003	33.80	53.18	23.70	74.79	6051	5
161.620819	35.92	51.52	26.94	77.80	6057	5
161.691666	34.74	59.74	28.60	85.54	6048	4
161.762527	28.95	55.86	39.86	85.45	6046	2
161.833359	33.94	49.58	35.32	79.43	6052	2
161.904190	37.23	50.22	37.16	83.29	6055	9
161.969788	41.21	45.08	42.67	85.86	5157	9
162.004517	49.49	59.12	19.57	80.94	772	22
162.044449	44.76	69.11	70.57	123.38	6051	22
162.115280	49.25	75.12	71.32	131.78	6055	22
162.186127	39.00	63.65	54.16	104.96	6062	22
162.256927	38.00	79.11	69.24	127.03	6059	22
162.327759	34.85	94.89	69.82	138.43	6053	22
162.398605	34.83	86.81	62.56	125.38	6057	32
162.469421	28.61	63.13	61.15	104.43	6047	32
162.540268	35.41	64.18	63.66	108.87	6053	27
162.611115	32.04	61.49	65.74	111.56	6051	27
162.681961	37.24	64.45	54.98	110.94	6051	18
162.752808	29.02	64.03	49.07	100.78	6051	15
162.823639	33.71	65.91	42.76	96.82	6053	15
162.894470	35.39	54.44	50.28	93.51	6059	12
162.964935	41.86	66.18	52.53	106.52	5990	12
163.035065	41.28	70.45	103.23	147.10	5984	7
163.105545	45.04	67.20	103.40	147.79	6054	7
163.176392	44.44	61.02	101.68	140.75	6062	15
163.247223	41.33	48.77	93.57	123.62	6049	15
163.318039	37.57	57.20	92.03	127.76	6056	12
163.388931	30.40	96.89	127.94	181.49	6043	39
163.459747	30.27	70.73	126.51	162.97	6046	39
163.530563	35.40	72.72	150.95	187.32	6048	32
163.601395	33.22	74.71	134.96	174.70	6051	32
163.813919	29.97	70.57	95.38	136.28	6035	39
163.884750	32.64	53.22	110.57	138.10	6058	6

163.955551	41.38	50.92	98.11	129.84	6053	6
163.995468	24.87	46.50	133.32	151.71	770	6
164.030243	47.99	57.42	35.17	91.26	5154	12
164.095825	48.63	55.72	32.63	88.57	6057	12
164.166656	43.03	54.38	36.08	86.25	6059	12
164.237503	40.67	62.23	32.62	89.57	6059	12
164.308350	37.32	63.05	34.37	91.48	6054	18
164.379181	33.90	44.47	28.04	69.83	6060	5
164.449997	30.70	43.90	21.67	64.67	6062	5
164.520828	32.19	51.42	25.68	73.34	6049	22
164.591690	32.06	64.93	56.36	104.46	6051	22
164.662506	30.70	70.51	45.29	101.97	6052	22
164.733353	29.83	61.54	49.24	98.90	6050	22
164.804230	27.44	48.20	44.54	84.11	6042	15
164.875031	32.02	56.75	34.25	81.46	6056	15
164.945877	34.53	50.00	47.20	89.34	6047	15
164.990631	50.72	64.55	70.25	128.36	1604	15
165.025375	36.51	49.83	31.95	78.55	4324	6
165.086105	39.11	65.64	40.17	96.57	6054	6
165.156952	37.73	61.49	36.67	88.74	6063	9
165.227753	35.59	77.66	41.32	105.60	6050	9
165.298615	32.97	65.75	34.00	93.21	6058	9
165.369446	26.99	61.93	44.86	90.48	6041	9
165.440292	23.87	55.36	47.43	87.97	6055	12
165.511108	27.18	55.01	58.91	96.80	6052	18
165.581940	27.74	57.00	53.11	94.41	6058	18
165.652771	27.91	48.90	27.03	70.95	6056	7
165.723633	26.19	44.95	30.23	68.87	6052	7
165.794464	27.07	46.21	31.62	70.33	6039	6
165.865295	29.45	51.12	37.11	78.57	6048	6
165.936127	32.12	52.84	40.88	82.69	6054	12
165.985748	41.12	82.36	57.31	122.44	2431	12
166.020172	34.36	60.75	49.74	95.86	3440	22
166.075714	39.59	87.32	64.35	131.91	6048	22
166.146545	33.04	62.44	54.96	102.21	6056	7
166.217361	31.88	61.58	53.26	97.39	6059	7
166.288177	31.01	52.85	48.02	86.92	6051	27
166.359039	26.67	69.58	75.40	118.39	6061	27
166.429871	26.16	43.95	50.31	81.63	6054	9
166.577240	28.06	58.07	44.82	88.60	5073	32
166.642349	26.60	65.92	58.37	102.27	6052	39
166.713211	24.61	56.32	64.12	99.10	6049	39
166.784058	25.76	52.15	64.67	98.68	6050	56
166.854889	28.20	70.08	72.48	118.49	6048	56
166.925751	31.65	63.67	69.50	113.83	6050	39
166.980545	34.58	60.74	59.76	105.55	3317	39
167.015289	35.69	67.47	48.64	99.18	2608	67
167.065979	34.00	61.10	64.22	108.64	6052	67
167.136810	31.17	67.49	67.71	115.24	6063	12
167.207657	33.18	51.60	71.34	104.58	6051	12
167.278458	33.73	59.85	53.07	96.89	6059	12
167.349289	27.56	47.58	51.94	84.88	6054	12
167.420166	25.20	56.51	68.70	103.17	6044	12
167.490982	27.10	45.57	58.14	88.58	6054	12
167.561798	27.17	61.46	64.54	107.60	6052	22
167.632645	27.05	56.45	58.30	98.23	6042	22
167.779739	33.87	65.72	62.27	109.55	5129	32
167.845169	30.12	71.84	71.15	120.05	6052	32
167.916000	31.20	64.44	65.91	110.65	6051	7
167.975693	34.89	79.15	69.50	123.09	4148	7
168.010422	32.64	39.07	16.83	59.75	1784	9
168.056259	36.20	68.01	46.86	101.81	6053	9
168.127090	35.04	56.66	31.51	82.53	6055	4
168.197922	34.35	48.65	26.64	72.46	6055	4
168.268738	33.40	43.65	23.19	65.13	6055	4
168.339584	28.36	40.71	24.18	62.75	6058	4
168.410400	24.67	47.96	30.09	70.12	6054	4
168.481247	25.52	45.59	23.57	63.91	6055	4
168.552063	28.12	47.51	22.10	66.31	6051	4
168.622910	30.60	54.43	25.78	74.56	6053	4
168.693771	27.93	47.42	26.29	68.73	6050	3

168.764618	25.91	42.88	34.41	69.38	6048	3
168.835464	27.59	45.14	35.26	72.09	6053	3
168.906281	28.99	50.60	39.63	79.36	6057	6
168.970840	30.56	65.37	52.84	101.43	4977	6
169.005569	39.41	43.48	9.42	62.16	950	5
169.046539	33.86	59.45	44.47	92.32	6052	5
169.117355	35.38	55.76	29.36	80.54	6056	5
169.188187	33.39	48.65	28.83	72.84	6050	3
169.259033	32.69	43.41	23.82	65.00	6059	4
169.329819	27.43	40.93	20.80	60.73	6042	4
169.400803	26.38	44.18	25.99	65.92	5642	4
169.471512	31.26	50.17	28.28	73.54	6049	4
169.542343	31.81	53.54	35.35	80.78	6052	7
169.613190	30.20	52.52	29.90	76.88	6052	7
169.684021	29.72	48.53	41.47	82.53	6050	9
169.754898	24.75	59.83	27.51	78.12	6049	6
169.825699	30.45	41.94	39.34	76.13	6047	6
169.896545	32.26	44.91	44.53	80.15	6053	7
169.965988	43.22	51.48	34.79	85.00	5817	7
170.000702	55.75	69.67	20.56	91.67	116	5
170.036789	46.50	53.00	34.62	88.88	6052	5
170.107590	45.91	56.50	33.31	89.67	6052	5
170.178467	42.25	49.48	28.43	78.78	6062	2
170.249298	43.05	47.75	21.49	73.76	6057	2
170.320145	38.47	46.36	24.48	72.79	6057	3
170.390991	34.88	52.49	30.80	79.38	6054	6
170.461807	29.58	50.01	37.28	79.30	6054	6
170.532623	35.03	50.67	24.33	74.54	6054	7
170.603455	34.14	49.99	38.07	80.67	6057	7
170.674301	35.19	49.63	40.66	85.19	6053	18
170.745148	27.84	56.55	57.08	99.30	6049	18
170.815994	26.19	55.39	53.08	94.40	6053	27
170.886810	35.47	56.45	63.42	103.25	6057	15
170.957657	42.14	60.72	48.14	100.38	6053	15
170.996521	22.18	38.67	19.83	56.44	594	15
171.031281	47.86	56.52	47.19	100.31	5335	12
171.097900	45.04	64.67	56.29	109.67	6054	12
171.168732	41.67	47.77	31.99	79.24	6059	15
171.239563	43.62	45.06	20.53	70.85	6061	15
171.310410	39.69	43.27	22.71	69.74	6062	2
171.381241	34.08	40.71	22.71	65.11	6055	3
171.452087	30.15	45.13	21.29	65.87	6059	3
171.522903	33.77	50.94	24.22	74.21	6051	2
171.593719	34.29	61.88	33.12	87.18	6052	2
171.664566	31.41	72.52	32.81	96.17	6051	7
171.735428	23.73	49.99	40.26	77.88	6049	7
171.806274	26.48	43.80	41.61	76.99	6054	6
171.877121	27.71	43.61	39.45	75.06	6056	5
171.947922	34.35	52.61	35.52	80.84	6057	5
171.991669	24.79	81.70	85.17	128.50	1428	5
172.026077	37.95	55.58	44.89	94.10	4445	9
172.087463	35.55	63.12	58.21	107.79	6051	9
172.158340	33.42	55.19	31.95	81.22	6058	6
172.229126	32.96	49.53	25.31	71.36	6054	6
172.300018	32.20	51.82	25.13	74.10	6060	7
172.370834	27.12	67.27	43.14	94.51	6056	7
172.441681	25.20	59.39	47.93	90.16	6054	7
172.512482	27.12	50.00	49.61	84.95	6049	9
172.583328	26.93	56.26	33.43	80.28	6051	9
172.654144	27.61	46.46	27.05	68.47	6051	4
172.725006	24.59	42.49	37.65	71.09	6048	4
172.795837	25.19	43.86	33.93	69.08	6042	4
172.866714	26.77	44.23	36.67	72.87	6049	4
172.937531	31.73	47.71	31.52	74.24	6060	4
172.986450	35.60	55.55	57.16	94.98	2315	4
173.021225	33.57	49.75	15.39	69.10	3614	4
173.077774	36.36	55.03	36.85	86.79	6049	4
173.148605	33.67	54.02	30.94	80.48	6061	3
173.219421	33.60	48.60	20.79	68.99	6049	3
173.290283	32.15	45.76	32.25	73.28	6062	3
173.361115	25.47	42.08	28.04	64.67	6061	3

173.431961	24.92	45.74	27.03	66.72	6049	4
173.502777	26.56	51.77	34.31	76.22	6050	5
173.573685	28.64	53.96	29.07	73.69	6017	5
173.644424	26.43	45.07	30.58	69.00	6055	6
173.715317	22.64	48.11	33.22	72.08	6052	6
173.786118	21.57	47.59	41.11	76.49	6052	6
173.856979	22.23	59.31	49.06	90.17	6044	6
173.927795	27.37	71.63	60.76	110.85	6054	18
173.981613	31.23	75.30	65.70	118.46	3138	18
174.016327	32.07	67.85	63.98	110.41	2789	22
174.068039	33.21	70.51	58.24	109.41	6049	22
174.138870	30.35	58.51	48.62	91.32	6059	7
174.209717	31.09	56.08	44.90	86.66	6057	7
174.280563	29.49	60.77	53.13	95.35	6051	7
174.351395	23.74	53.93	54.91	89.47	6060	7
174.422226	22.05	49.04	56.53	86.16	6055	15
174.493042	24.07	48.10	49.92	81.40	6049	15
174.640121	26.53	61.29	50.37	93.80	5121	6
174.705597	25.10	57.02	58.82	96.35	6051	6
174.776428	24.55	52.75	61.14	96.75	6043	18
174.847290	24.64	55.15	54.98	93.58	6038	18
174.918076	29.74	51.41	56.08	96.35	6057	5
174.976730	35.00	68.64	56.41	109.13	3969	5
175.011459	39.79	31.28	16.87	61.11	1958	9
175.058319	34.66	62.66	41.47	92.61	6047	9
175.129150	33.33	76.41	40.44	106.34	6061	22
175.200012	30.99	76.20	51.17	109.63	6054	22
175.270844	28.69	65.69	39.05	92.13	6055	7
175.341660	23.18	41.53	21.26	58.58	6060	7
175.412506	21.98	38.21	21.36	55.54	6059	6
175.483337	23.30	47.31	23.54	63.49	6053	6
175.554138	34.97	76.85	62.86	115.45	6048	56
175.625076	26.54	82.10	59.35	116.78	6028	32
175.695862	23.30	57.43	44.16	89.26	6042	32
175.766678	30.71	80.26	86.89	139.35	6049	56
175.837540	29.85	84.40	71.08	130.46	6038	56
175.908386	36.32	86.52	73.06	133.25	6037	27
175.971909	45.83	79.03	84.35	142.64	4781	27
176.006607	37.36	52.59	48.87	86.46	1127	39
176.048630	39.61	91.99	62.23	133.89	6043	39
176.119446	34.88	63.46	38.22	91.36	6059	39
176.190399	30.62	80.19	44.68	106.78	6024	27
176.261124	36.57	90.42	80.65	141.21	6048	27
176.331940	28.69	57.33	38.40	83.55	6052	27
176.402771	25.08	42.01	30.19	64.72	6055	9
176.473618	23.97	49.50	31.13	70.41	6054	9
176.544464	28.91	49.69	26.32	70.27	6050	5
176.615280	31.16	53.48	26.32	74.45	6052	5
176.686127	29.61	47.02	24.89	70.20	6051	4
176.756973	27.48	45.24	29.47	69.62	6055	4
176.827805	28.33	45.44	29.06	69.15	6049	4
176.898651	33.16	46.85	36.59	78.54	6057	7
176.967056	40.45	52.93	35.00	85.82	5634	7
177.001740	45.69	89.82	20.31	103.03	293	5
177.038849	41.33	53.40	33.59	86.36	6046	5
177.109726	38.42	54.56	31.59	83.26	6054	5
177.180573	34.38	57.26	27.62	79.22	6064	3
177.251373	34.87	44.77	20.33	64.97	6053	3
177.322205	29.61	37.78	19.97	59.34	6059	3
177.393051	25.27	39.49	21.83	58.05	6060	3
177.463882	23.35	44.21	21.04	60.77	6055	3
177.534714	28.02	52.42	33.63	76.10	6052	3
177.605560	28.64	57.63	34.31	81.40	6050	3
177.676407	26.60	59.09	35.83	82.43	6054	3
177.747238	23.99	48.43	38.88	75.09	6045	3
177.818085	26.48	45.91	40.07	76.73	6055	6
177.888931	31.27	47.56	52.91	88.95	6054	18
177.959717	35.28	51.14	43.78	87.61	6052	18
177.997574	15.18	49.92	12.26	57.54	415	18
178.031952	41.36	63.19	53.70	106.17	5460	12
178.099335	39.14	90.60	82.91	148.19	6043	12

178.170181	31.44	122.61	96.73	178.88	6043	18
178.240997	34.33	103.20	84.86	151.82	6053	18
178.311798	31.26	99.45	77.72	142.86	6051	32
178.382660	32.47	118.94	98.62	175.61	6050	48
178.453491	30.25	89.35	90.63	146.34	6055	48
178.524323	30.98	86.89	67.90	130.97	6036	56
178.667145	37.88	87.82	70.91	135.84	5852	32
178.736832	40.29	88.75	86.64	149.17	6052	32
178.807678	37.91	76.93	72.99	128.07	6053	80
178.878510	37.51	80.70	90.95	143.90	6057	39
178.949356	44.03	81.14	72.30	133.85	6058	39
178.992371	40.61	106.92	71.95	152.76	1305	39
179.027130	48.51	70.74	59.27	118.82	4621	32
179.089569	40.97	81.03	47.23	115.13	6054	32
179.160370	36.91	62.40	41.65	94.83	6045	12
179.231232	36.51	60.68	32.63	84.42	6054	12
179.302094	32.48	63.02	42.79	93.71	6061	15
179.372955	25.17	57.51	43.65	86.64	6053	15
179.442993	26.24	50.16	37.56	76.60	5880	9
179.514572	34.42	53.61	49.50	90.19	6050	22
179.585403	34.00	54.80	51.89	91.24	6051	22
179.656219	31.78	48.15	48.06	82.53	6050	15
179.727112	31.27	48.52	51.99	87.58	6053	15
179.797943	29.89	62.69	71.92	109.69	6053	15
179.868790	27.87	65.59	68.42	108.71	6051	15
179.939606	34.35	65.64	80.50	119.58	6058	22
179.987488	45.84	121.52	109.45	186.00	2135	22
180.022263	37.85	74.22	81.39	130.54	3796	15
180.079865	37.99	93.81	85.19	151.24	6054	15
180.150696	33.78	96.72	71.04	144.22	6058	15
180.221512	33.16	55.23	55.04	94.23	6058	15
180.292603	31.24	49.21	56.03	89.94	5936	5
180.363190	23.85	53.70	68.90	101.98	6058	5
180.434021	24.34	55.37	74.81	105.75	6058	5
180.504837	33.20	47.33	73.81	102.63	6051	7
180.575653	35.93	43.62	86.00	114.31	6050	7
180.646500	37.52	51.22	91.55	126.18	6050	7
180.717407	37.33	57.36	69.00	110.10	6049	7
180.794022	34.86	48.11	59.22	94.40	4264	7
180.859055	39.29	59.91	60.83	105.06	6052	7
180.929901	41.05	68.46	60.98	114.38	6059	15
180.982620	48.59	76.08	41.80	109.09	2961	15
181.017380	34.82	80.31	69.39	129.69	2964	18
181.070145	46.96	107.24	86.95	167.42	6056	18
181.140991	38.81	107.60	69.71	155.96	6052	9
181.211792	38.68	86.41	66.82	129.47	6058	9
181.282639	41.42	91.83	61.35	133.39	6056	12
181.359985	27.36	50.36	56.59	95.33	4881	12
181.424316	28.20	51.81	39.70	84.37	6059	4
181.495148	31.40	52.53	40.39	85.38	6051	4
181.565964	35.36	58.41	47.16	97.88	6049	6
181.636841	37.29	45.12	41.47	86.24	6040	5
181.707642	38.77	45.84	37.62	82.22	6046	5
181.778488	36.88	45.97	40.27	82.74	6054	3
181.849335	33.81	49.76	36.94	82.30	6053	3
181.920166	36.58	55.08	45.32	91.72	6057	5
181.977768	38.73	69.87	33.89	97.19	3789	5
182.012497	41.73	58.17	64.36	108.69	2137	2
182.060410	39.14	68.69	47.92	104.18	6055	2
182.131256	38.24	55.13	40.77	92.75	6059	2
182.202148	37.25	44.86	44.14	86.33	5996	2
182.272919	39.59	40.22	45.27	84.78	6050	2
182.343750	32.91	36.61	46.62	80.94	6060	2
182.414612	26.99	47.07	55.63	89.75	6050	5
182.485413	28.94	52.19	47.24	88.52	6053	5
182.556244	26.32	61.37	29.15	80.68	6052	4
182.627075	29.94	62.27	31.97	83.42	6056	5
182.697922	27.83	48.66	28.29	71.69	6048	5
182.768738	25.13	44.66	33.68	69.90	6043	9
182.839615	28.05	48.44	38.48	77.40	6047	9
182.910446	31.65	54.21	43.70	86.01	6054	6

182.972931	39.27	67.90	53.23	107.27	4621	6
183.007645	36.11	41.68	18.78	60.44	1308	9
183.050690	38.38	74.14	52.50	110.88	6048	9
183.121521	33.59	74.45	44.23	105.55	6061	9
183.192383	33.61	49.17	31.58	75.43	6061	4
183.263199	35.76	64.04	39.33	91.83	6054	9
183.334015	28.44	54.76	31.32	78.26	6051	9
183.404861	24.47	46.23	32.22	68.89	6056	5
183.478836	27.09	51.92	24.90	69.91	5436	5
183.546524	28.95	53.94	23.31	71.48	6042	4
183.617355	32.03	53.97	27.35	74.50	6054	4
183.688232	26.08	64.89	26.43	83.33	6051	3
183.759064	22.58	52.30	29.47	70.41	6040	12
183.829880	23.89	47.04	35.26	72.91	6056	12
183.900711	29.37	48.03	37.98	76.13	6055	9
183.968079	35.91	52.63	33.08	81.23	5455	9
184.002792	50.20	58.14	20.45	80.81	474	4
184.040970	37.72	55.67	31.10	83.80	6050	4
184.111816	35.66	59.95	34.91	87.74	6057	4
184.182663	34.65	58.11	27.05	80.05	6062	6
184.253433	34.88	43.57	20.69	64.86	6049	4
184.324310	29.58	48.89	25.95	69.52	6051	4
184.395142	23.88	42.08	22.86	60.22	6057	3
184.465958	25.71	38.97	26.12	60.43	6053	3
184.536789	29.69	48.48	24.67	68.34	6052	4
184.607620	31.18	51.25	27.87	73.00	6052	4
184.678497	27.71	50.61	32.89	73.42	6053	5
184.749313	22.94	42.90	32.57	65.96	6043	5
184.820145	24.33	47.02	36.76	72.09	6055	4
184.890991	27.78	52.79	35.93	77.78	6052	4
184.961823	36.34	52.91	33.82	82.70	6055	4
184.998596	20.41	51.95	8.10	58.11	235	4
185.033005	38.03	56.42	43.35	91.77	5638	7
185.101379	34.70	66.96	34.16	92.41	6054	7
185.172195	34.77	56.30	33.24	81.55	6058	6
185.243057	35.03	51.60	29.22	76.84	6042	6
185.313904	28.57	48.09	31.97	72.85	6053	5
185.384720	25.23	49.22	31.29	71.44	6057	7
185.455566	24.36	57.61	46.60	87.11	6052	7
185.526382	27.54	64.86	55.44	100.59	6043	12
185.597214	27.17	67.21	34.68	88.27	6049	12
185.668060	25.89	59.87	31.24	80.70	6054	6
185.738907	23.62	48.17	28.95	68.62	6048	6
185.809738	24.50	50.50	34.30	74.13	6046	7
185.880615	27.13	45.10	39.67	76.36	6053	12
185.951401	32.75	61.00	37.74	86.41	6054	12
185.993408	21.96	69.17	54.79	101.61	1125	12
186.028137	42.28	72.12	56.03	112.55	4797	9
186.091660	36.72	69.30	43.23	100.83	6051	9
186.162506	31.41	79.69	36.44	103.85	6064	7
186.233353	30.72	60.14	24.65	79.10	6052	7
186.304184	28.28	50.89	23.04	70.16	6062	3
186.375031	21.81	42.47	22.47	59.13	6059	7
186.445862	21.32	52.34	32.90	73.76	6049	7
186.516663	24.00	54.66	32.50	73.94	6048	18
186.587494	27.96	62.44	33.81	85.06	6051	18
186.658340	26.38	76.77	28.06	94.42	6055	7
186.729202	23.65	50.96	46.58	85.48	6054	7
186.800034	23.78	46.62	40.13	75.69	6051	7
186.870880	22.74	62.55	43.37	88.99	6054	7
186.941711	26.99	56.87	37.95	83.15	6053	6
186.988556	35.15	74.51	78.70	125.92	1956	6
187.023315	30.36	58.26	28.53	82.79	3970	5
187.081955	30.82	59.78	42.59	90.46	6055	5
187.152802	29.53	58.54	33.17	82.14	6060	6
187.223602	30.51	53.77	26.02	74.60	6054	6
187.294464	28.12	68.55	38.26	93.73	6060	9
187.365295	23.11	77.29	45.66	102.92	6051	9
187.436127	21.00	70.94	50.79	102.03	6052	12
187.506927	21.52	54.58	37.62	78.26	6044	18
187.577774	27.32	57.46	44.02	90.77	6054	18

187.648590	24.36	58.97	44.32	88.65	6055	15
187.719482	24.58	52.32	41.43	82.92	6046	15
187.790298	25.69	53.52	40.52	82.38	6042	6
187.861130	24.17	48.51	33.83	74.23	6047	6
187.931992	28.54	62.99	42.04	91.60	6054	3
187.983688	34.25	57.49	59.61	101.78	2784	3
188.018433	27.14	59.10	25.61	79.35	3145	3
188.072250	32.29	60.56	42.62	91.59	6054	3
188.143051	29.16	60.70	40.79	88.49	6060	5
188.213928	30.31	46.42	31.09	72.36	6051	5
188.284729	28.41	46.12	22.06	65.60	6062	5
188.355576	23.09	49.82	32.22	71.66	6058	5
188.426407	21.29	43.85	31.33	66.37	6056	4
188.497238	24.31	46.74	39.62	75.03	6050	4
188.568039	29.03	43.13	40.62	75.57	6050	7
188.638885	28.30	61.68	41.64	87.91	6050	6
188.709747	25.43	49.93	42.53	81.80	6044	6
188.780563	26.06	52.73	40.70	83.27	6050	7
188.851425	23.40	54.88	36.63	79.62	6053	7
188.922272	26.77	52.90	41.08	81.89	6060	5
188.978806	26.49	63.97	63.80	105.28	3611	5
189.013550	32.85	61.67	19.61	80.60	2315	7
189.062515	29.98	64.03	51.10	99.40	6054	7
189.131882	28.57	57.76	44.70	88.94	5780	5
189.205399	37.26	51.59	29.23	76.99	5840	5
189.274994	36.02	49.99	22.23	71.09	6055	4
189.345810	29.06	48.38	27.58	70.66	6052	4
189.416672	25.87	40.95	24.54	62.29	6057	5
189.487503	26.35	44.90	22.17	63.73	6049	5
189.558334	27.40	50.09	24.58	67.58	6053	4
189.629150	28.86	58.15	31.97	80.62	6054	4
189.699997	26.82	49.40	29.33	70.38	6053	4
189.770828	23.31	42.01	34.77	67.74	6051	6
189.841690	24.99	46.64	33.74	70.57	6047	6
189.912521	29.72	58.14	40.96	86.78	6055	6
189.973938	34.68	61.16	39.73	89.55	4443	6
190.008667	35.60	33.04	21.73	60.29	1484	6
190.052750	36.17	60.71	32.81	87.95	6052	6
190.123611	38.28	57.35	35.32	87.39	6063	6
190.194443	34.03	60.20	36.39	89.42	6058	7
190.265259	34.48	53.53	22.02	73.47	6061	3
190.336105	27.37	44.98	21.15	63.40	6060	3
190.406937	25.29	41.99	23.49	61.60	6051	6
190.477753	26.95	49.57	32.58	72.54	6049	6
190.548584	28.60	54.36	37.99	81.29	6052	9
190.619446	29.90	49.43	54.55	90.92	6046	9
190.690277	26.48	46.81	50.29	85.81	6054	9
190.761093	20.39	49.62	46.39	80.19	6043	6
190.831955	23.47	49.11	38.21	76.18	6053	6
190.902786	29.09	48.17	44.40	81.13	6053	2
190.969101	36.43	46.49	38.11	83.15	5278	2
191.003479	57.24	43.04	12.94	75.74	591	3
191.042328	40.12	52.78	39.90	89.64	6048	3
191.113190	41.00	57.90	27.90	85.95	6056	3
191.184021	38.12	45.78	28.18	74.11	6061	4
191.254852	40.09	57.16	23.54	81.04	6061	6
191.325699	33.18	61.91	36.28	89.40	6058	6
191.396530	30.54	41.66	22.95	63.85	6057	6
191.467361	28.11	52.74	36.18	78.12	6049	6
191.538177	30.44	55.22	41.02	85.59	6047	6
191.609009	31.32	56.77	33.58	81.20	6051	6
191.679855	28.63	48.61	27.66	71.36	6051	5
191.750687	21.74	50.21	34.52	71.61	6040	6
191.821564	22.96	46.72	42.66	77.56	6044	6
191.892380	30.87	45.66	38.13	75.06	6058	9
191.963211	38.35	57.02	46.63	93.40	6052	9
191.999298	25.03	76.81	20.64	83.85	118	9
192.034042	40.06	63.80	44.02	100.36	5806	6
192.103470	40.13	57.14	36.27	89.50	6055	6
192.174286	37.65	46.96	32.70	76.55	6035	9
192.245132	39.87	66.45	51.81	104.29	6055	9

192.315979	32.63	80.25	80.47	135.64	6056	27
192.386810	29.45	80.84	46.24	109.12	6058	18
192.457703	29.07	54.21	39.09	81.88	6034	18
192.528549	32.54	69.83	54.59	106.64	6021	22
192.599289	31.79	66.68	32.08	88.68	6057	22
192.670120	30.35	56.56	34.53	81.45	6044	22
192.740997	22.52	46.24	49.61	80.88	6049	22
192.811859	24.42	63.96	44.35	91.81	6041	39
192.882660	27.12	49.24	46.35	83.62	6059	15
192.953491	31.85	47.10	47.84	88.16	6059	15
192.994431	18.82	51.59	29.18	65.11	949	15
193.029221	42.35	57.91	36.34	96.87	4966	18
193.093765	36.66	66.67	35.48	95.46	6049	18
193.164673	32.86	75.42	65.02	118.99	6013	32
193.235474	28.38	86.60	45.92	114.65	6031	32
193.306290	29.71	89.02	49.33	118.77	6045	18
193.377182	24.38	70.00	53.72	102.38	6018	32
193.447952	26.60	85.74	64.42	123.35	6047	32
193.518784	31.12	69.34	75.88	121.86	6029	56
193.589554	34.42	71.75	97.92	141.53	6047	56
193.660431	31.16	53.31	59.23	100.26	6047	32
193.731262	21.37	68.38	41.20	92.72	6047	32
193.802109	25.25	67.44	67.47	112.40	6049	32
193.872971	28.05	82.78	76.43	130.91	6046	32
193.943802	32.42	69.48	67.42	115.55	6038	48
193.989563	32.10	147.76	81.17	193.01	1781	48
194.024323	42.31	70.74	79.52	131.73	4148	22
194.084015	36.09	69.77	59.12	109.63	6055	22
194.154861	36.81	63.28	42.03	94.00	6063	12
194.225677	38.37	47.77	28.32	73.29	6057	12
194.296524	37.30	49.72	24.92	74.16	6059	5
194.367355	31.09	44.38	23.25	65.54	6053	5
194.438217	26.01	39.51	24.05	59.90	6050	9
194.509033	29.79	45.72	29.49	69.91	6055	3
194.579849	31.00	53.36	24.48	73.94	6050	3
194.650665	29.96	48.47	29.15	72.20	6055	6
194.721542	24.01	62.05	40.69	87.17	6054	6
194.792389	23.67	58.12	37.88	82.37	6051	6
194.863220	27.23	55.52	39.45	82.68	6053	6
194.934052	33.87	53.84	37.28	83.22	6058	6
194.984741	43.65	66.91	64.29	112.50	2602	6
195.019470	32.15	48.23	33.99	76.81	3313	4
195.074310	37.64	58.22	49.86	97.05	6052	4
195.145126	33.56	59.82	44.95	91.28	6057	7
195.215958	34.43	47.24	42.59	80.81	6060	7
195.286789	32.24	55.13	50.55	90.82	6055	9
195.357651	26.30	50.64	57.16	90.00	6051	9
195.428482	27.53	81.84	78.42	129.00	6049	67
195.499420	31.84	86.27	87.65	142.29	6014	67
195.570190	35.43	100.04	109.59	172.60	6028	132
195.640991	41.06	77.62	141.95	188.44	6036	94
195.786987	23.69	51.86	63.97	96.16	5313	12
195.853455	25.23	59.07	59.73	99.89	6048	12
195.924347	31.71	60.30	66.35	110.35	6057	15
195.979828	29.81	69.96	59.81	108.56	3430	15
196.014236	41.16	64.83	41.11	97.96	2435	15
196.063889	37.32	78.81	48.27	111.66	6053	15
196.134689	34.98	73.66	41.97	104.10	6054	15
196.205551	35.92	70.35	38.21	96.03	6058	15
196.276382	32.98	69.80	38.97	95.29	6063	18
196.347229	26.65	55.02	34.44	79.36	6058	18
196.418060	24.61	60.83	47.57	93.79	6054	27
196.488892	25.70	60.95	56.80	101.01	6054	27
196.559692	27.42	52.74	36.74	80.52	6053	27
196.630539	27.24	69.20	50.99	100.66	6047	154
196.701401	30.55	73.99	79.51	129.85	6054	154
196.772293	35.13	118.36	119.44	187.46	6035	111
196.843582	34.29	86.66	91.29	145.26	5904	111
196.913925	38.56	71.21	54.99	113.93	6044	39
196.974625	42.52	61.86	41.27	104.46	4317	39
197.009369	32.71	62.15	36.70	86.36	1606	15

197.054153	38.64	71.52	43.93	104.77	6050	15
197.125015	41.34	81.86	51.11	117.12	6049	22
197.195831	35.12	82.78	48.20	113.80	6061	22
197.266708	31.64	62.92	26.94	82.02	6047	39
197.337494	31.33	81.61	61.03	122.81	6045	39
197.408340	29.81	91.81	77.24	138.50	6045	32
197.479172	42.57	105.07	81.91	159.66	6056	32
197.549973	42.99	94.09	74.65	147.83	6041	207
197.620819	47.88	101.82	72.40	153.01	6032	207
197.691650	54.61	142.87	125.83	228.33	6012	300
197.762589	72.60	135.84	172.69	258.97	6017	400
197.833374	82.98	289.37	181.49	381.62	6037	400
197.904160	125.29	323.53	202.86	458.36	6019	300
197.969818	117.14	240.45	183.08	378.33	5044	300
198.004517	53.77	448.27	71.86	458.52	772	179
198.044495	100.91	228.75	110.03	310.89	6012	179
198.115372	81.48	187.00	118.64	272.62	6032	179
198.186310	72.91	169.67	126.67	251.75	5997	80
198.256989	75.22	122.69	69.53	178.02	6041	32
198.327774	64.01	119.46	59.90	164.36	6060	32
198.398605	56.51	105.76	54.40	147.99	6053	39
198.469437	54.87	94.39	37.29	131.61	6056	39
198.540329	50.99	91.19	34.77	127.77	6035	39
198.611115	51.72	97.65	35.03	135.11	6054	39
198.681946	53.01	92.94	40.97	137.56	6051	15
198.752808	50.35	86.78	46.64	135.40	6052	7
198.827927	40.32	84.11	23.94	109.07	4906	7
198.894485	56.39	76.08	43.56	124.14	6059	6
198.964951	60.70	77.48	37.79	123.38	5999	6
199.035080	61.41	74.89	35.10	117.15	5994	15
199.105545	64.30	83.55	42.35	124.83	6054	15
199.176376	64.21	70.86	34.66	112.25	6060	12
199.247223	64.78	57.96	28.98	99.60	6051	12
199.318054	58.35	52.08	27.01	92.54	6062	9
199.379822	55.23	51.68	31.81	92.62	4476	9
199.459717	48.70	59.99	28.26	91.85	6054	9
199.530563	51.06	62.99	32.81	98.99	6048	9
199.601379	51.47	72.68	28.55	104.90	6055	9
199.672241	54.20	63.18	27.99	100.13	6049	5
199.743073	45.45	58.36	39.52	95.64	6052	5
199.813919	46.72	50.26	37.71	91.48	6044	4
199.885498	50.20	55.71	37.01	92.58	5786	5
199.955612	58.60	59.68	37.09	103.19	6050	5
199.995483	42.43	54.22	25.28	84.65	772	5
200.030228	60.85	69.17	42.51	112.04	5160	6
200.095840	60.10	77.31	47.12	120.30	6057	6
200.166656	54.79	74.06	42.92	111.73	6061	9
200.237473	48.50	80.81	49.95	118.63	6053	9
200.308350	51.42	54.32	23.99	86.68	6062	9
200.379166	45.41	49.02	25.22	79.57	6057	5
200.449997	41.90	53.89	28.74	82.85	6059	5
200.520828	43.65	56.87	34.74	90.64	6048	15
200.591660	41.17	58.52	32.94	90.01	6036	15
200.662506	42.63	55.33	37.91	90.66	6046	15
200.733353	35.13	57.27	39.55	89.48	6050	15
200.804199	35.78	48.81	34.10	81.15	6053	15
200.875031	47.45	55.75	41.05	95.26	6058	18
200.945862	52.34	57.43	39.39	98.04	6054	18
200.990616	68.84	62.07	39.09	114.41	1600	18
201.025040	53.26	62.61	37.92	100.56	4266	9
201.085419	56.50	64.80	39.75	106.52	6056	9
201.156250	51.49	67.33	31.73	99.46	6057	4
201.227066	50.96	51.38	23.84	83.05	6054	4
201.297913	51.45	44.95	18.68	77.23	6062	3
201.368759	43.08	45.40	22.45	73.67	6059	3
201.439590	38.99	56.22	32.63	85.84	6058	4
201.510422	38.99	56.53	35.04	87.20	6052	7
201.581268	35.50	60.73	27.17	84.43	6047	7
201.652054	41.09	65.62	36.37	95.98	6054	32
201.722977	33.36	54.35	48.75	93.23	6041	32

201.793777	35.35	51.51	45.12	88.64	6039	22
201.864655	39.72	49.35	55.69	98.82	6046	22
201.935471	53.84	75.75	64.53	128.03	6039	32
201.985413	55.42	93.89	77.10	150.42	2488	32
202.020172	49.78	54.01	33.67	89.05	3440	39
202.075684	58.38	72.14	61.50	126.05	6049	39
202.146530	57.43	134.33	107.30	199.07	6043	80
202.217346	59.40	85.24	81.26	146.78	6055	80
202.288223	50.66	132.04	94.60	188.37	6052	56
202.359039	46.60	139.00	93.68	189.99	6058	56
202.429855	46.54	128.43	72.33	171.06	6059	48
202.500687	41.12	86.63	81.11	145.35	6052	27
202.571533	40.02	91.02	81.91	147.00	6038	27
202.642319	44.41	80.58	32.24	109.17	6046	9
202.713211	43.52	65.51	40.41	106.63	6050	9
202.784042	41.27	53.21	42.29	95.85	6039	18
202.854889	44.52	67.20	40.13	104.52	6049	18
202.925720	47.41	77.78	44.13	111.49	6055	15
202.980530	47.06	88.14	72.35	136.47	3307	15
203.015289	47.27	78.58	34.65	109.59	2610	12
203.066025	44.43	89.06	48.87	122.71	6039	12
203.136810	42.62	69.39	50.58	106.38	6059	7
203.207611	46.50	52.82	30.72	84.78	6057	7
203.278488	44.86	44.95	20.01	73.13	6062	4
203.349304	35.26	42.37	28.03	70.54	6056	4
203.420135	30.50	42.19	29.97	68.05	6054	5
203.490982	33.67	46.85	51.04	87.35	6048	5
203.561813	34.07	53.70	35.11	83.81	6053	9
203.632614	33.38	54.91	34.52	83.79	6053	5
203.703491	30.92	55.05	39.45	86.03	6056	5
203.774338	31.98	53.73	36.76	82.74	6053	5
203.845169	34.53	55.03	31.56	81.65	6055	5
203.911591	39.04	58.85	33.39	86.58	5305	6
203.976334	44.67	66.62	54.96	107.15	4038	6
204.010391	34.32	56.05	44.49	91.02	1777	6
204.056229	41.64	78.14	52.55	114.71	6044	6
204.127106	40.57	69.00	40.00	100.20	6057	9
204.197922	38.88	66.30	47.20	102.95	6060	9
204.268753	36.27	59.76	32.72	86.05	6052	9
204.339584	30.89	78.12	50.42	113.30	6058	9
204.410431	30.05	78.55	65.09	121.44	6050	18
204.481247	31.48	78.35	65.37	123.79	6047	18
204.552078	30.84	71.44	67.54	120.73	6048	9
204.622910	34.44	72.62	71.17	125.83	6057	9
204.693771	36.30	85.60	56.49	127.49	6047	22
204.764587	34.07	74.71	51.06	113.49	6046	15
204.835464	32.51	65.17	44.08	99.41	6052	15
204.906265	35.29	59.67	34.14	87.31	6050	7
204.970840	41.39	62.99	43.88	96.42	4975	7
205.005569	35.34	78.94	19.64	89.24	950	7
205.046539	42.54	70.93	48.39	106.25	6055	7
205.117386	41.28	72.44	44.15	104.51	6052	7
205.188202	38.93	77.40	41.92	106.65	6059	9
205.259033	39.56	53.90	20.89	76.98	6061	5
205.329880	32.40	40.89	17.29	62.04	6060	5
205.400711	27.25	39.07	17.84	57.36	6052	6
205.471512	27.05	44.87	28.15	67.82	6052	6
205.542374	29.56	57.15	44.03	86.51	6044	22
205.613205	33.05	73.18	46.94	106.39	6050	22
205.684097	32.60	86.91	61.89	130.08	6031	39
205.754883	34.04	84.00	71.52	130.92	6050	80
205.825714	37.45	89.84	67.46	139.70	6054	80
205.896576	40.35	83.17	52.54	123.64	6056	18
205.965988	46.41	81.23	51.64	120.09	5814	18
206.000702	39.56	150.70	33.68	159.48	117	9
206.036835	45.41	85.52	53.66	125.90	6049	9
206.107651	43.31	81.14	50.85	119.06	6048	9
206.178467	42.74	75.22	58.04	117.83	6061	9
206.249313	39.52	74.06	34.60	100.56	6056	9
206.320145	34.84	62.29	27.82	85.62	6053	5
206.390991	31.01	48.83	34.56	75.68	6059	2

206.461807	28.96	46.82	34.49	72.66	6055	2
206.532608	32.65	50.47	33.12	77.41	6041	3
206.603470	32.57	56.23	31.71	80.45	6051	3
206.674316	31.23	59.34	36.03	86.39	6055	2
206.745148	34.00	52.14	39.51	84.54	6051	2
206.815994	33.96	51.53	40.49	85.44	6052	2
206.886826	36.49	53.96	41.10	88.46	6058	6
206.957657	42.86	56.54	38.88	91.77	6054	6
206.996521	18.13	45.12	18.67	58.30	591	6
207.030930	45.10	66.46	42.73	100.61	5279	5
207.097244	39.92	77.92	49.07	112.62	6043	5
207.168060	37.46	78.78	48.39	109.88	6064	5
207.238861	37.24	44.19	23.19	67.95	6046	5
207.309738	34.70	39.65	20.38	63.47	6056	3
207.380585	29.54	40.80	23.29	61.77	6059	4
207.451385	26.33	45.45	26.16	65.18	6052	4
207.522232	28.93	52.25	28.59	73.54	6050	6
207.593063	31.38	62.69	33.48	85.79	6056	6
207.663895	30.15	55.05	34.81	80.72	6052	7
207.734756	30.98	55.28	40.19	85.73	6051	7
207.805618	33.77	52.83	37.78	84.39	6047	5
207.876419	34.38	52.11	40.77	86.02	6052	7
207.947266	38.10	51.81	28.79	80.59	6058	7
207.991333	46.79	105.29	54.17	134.93	1485	7
208.026093	35.97	53.74	40.94	87.58	4441	7
208.087509	39.12	68.87	37.62	96.75	6050	7
208.158340	35.49	63.79	31.10	87.71	6058	9
208.229156	34.10	56.50	28.56	79.60	6052	9
208.300003	33.26	109.76	69.80	148.45	6054	18
208.368835	31.56	101.81	67.38	138.57	5513	18
208.442245	30.63	74.81	57.95	110.30	5205	12
208.512482	31.88	62.83	54.75	102.00	6050	22
208.583313	30.97	72.83	74.04	122.92	6051	22
208.654160	30.14	69.30	53.69	108.46	6057	12
208.725006	28.75	64.89	52.43	103.17	6045	12
208.795853	31.95	65.57	64.19	113.23	6042	32
208.866714	37.64	77.63	49.56	113.65	6049	32
208.937607	40.95	61.18	62.16	111.13	6037	39
208.986450	47.92	99.73	71.54	152.04	2308	39
209.021210	46.65	61.27	69.91	120.12	3613	22
209.077759	45.73	87.96	62.20	132.45	6055	22
209.148605	40.51	54.68	45.43	93.53	6061	7
209.219421	44.44	47.65	44.09	88.56	6053	7
209.290253	42.02	43.82	45.56	84.55	6055	3
209.361115	34.74	42.58	47.99	81.36	6058	3
209.431961	29.94	44.08	47.81	79.95	6053	2
209.502762	31.91	45.47	46.78	82.62	6055	3
209.573593	32.86	54.11	45.91	89.05	6052	3
209.644440	33.25	55.45	53.80	95.10	6052	4
209.790573	34.66	53.35	58.23	97.14	5293	6
209.857101	34.35	51.71	54.54	94.76	5999	6
209.927795	40.25	58.44	52.60	101.35	6057	9
209.981583	41.25	56.19	66.45	108.42	3139	9
210.016342	38.40	64.67	30.15	88.73	2788	12
210.068039	42.96	81.21	55.86	120.70	6056	12
210.138901	35.02	82.35	47.98	113.94	6044	15
210.209717	33.01	98.08	60.98	133.83	6059	15
210.280609	35.49	116.43	75.58	160.35	5978	39
210.351379	34.53	82.49	94.51	149.34	6044	39
210.422226	29.47	67.52	46.49	99.21	6053	32
210.493134	32.09	66.01	60.84	108.66	6025	32
210.563934	41.80	78.69	75.53	134.49	6034	67
210.634705	46.90	72.29	77.87	138.83	6045	67
210.705627	61.43	120.04	120.71	209.36	5976	67
210.776428	55.08	80.65	51.50	130.62	6039	18
210.847229	44.52	58.71	35.33	98.01	6050	18
210.918076	45.06	60.67	34.13	95.84	6056	6
210.976685	45.76	86.69	45.05	120.01	3960	6
211.011459	57.35	53.88	18.34	91.53	1960	27
211.058334	49.14	93.47	70.05	146.23	6048	27
211.129166	42.29	103.81	62.42	144.13	6050	22

211.200027	38.14	97.04	78.02	144.81	6046	22
211.270828	37.52	142.15	74.43	179.42	6048	22
211.341660	36.97	99.81	54.41	134.74	6062	22
211.412491	43.37	99.19	85.78	155.39	6051	67
211.483246	49.25	83.72	95.01	152.49	6030	67
211.554169	44.35	67.60	47.04	109.82	6045	39
211.624985	45.81	57.61	41.21	100.14	6049	39
211.695847	47.27	55.73	36.49	97.00	6051	18
211.766663	49.69	55.07	35.47	97.75	6049	9
211.837494	43.25	67.32	30.65	99.75	6054	9
211.908340	48.05	62.00	41.00	102.19	6056	12
211.971893	56.96	59.84	35.91	104.16	4799	12
212.006256	24.34	54.77	15.41	64.69	1069	12
212.047928	48.91	71.13	35.72	103.34	6051	12
212.118744	42.56	88.43	67.01	135.25	6061	12
212.189590	34.55	76.81	50.30	111.46	6063	15
212.260422	33.85	40.48	22.45	63.87	6062	4
212.331268	32.55	37.63	23.52	62.14	6055	4
212.402084	28.55	35.72	21.57	58.26	6052	5
212.472900	30.18	41.57	31.19	68.39	6049	5
212.543732	34.84	49.61	28.06	74.42	6049	9
212.614578	37.20	56.41	33.15	88.40	6048	9
212.685410	42.09	50.08	28.90	82.17	6051	6
212.756271	39.31	46.84	37.82	85.54	6048	7
212.827087	37.23	52.99	31.51	83.11	6052	7
212.897934	39.20	55.69	41.22	91.76	6055	7
212.966690	43.37	53.21	32.03	85.87	5694	7
213.001404	39.75	83.09	29.41	96.85	235	5
213.038193	44.05	59.62	30.58	88.60	6049	5
213.109024	39.94	64.81	46.21	97.62	6057	5
213.179855	32.42	82.72	57.19	116.99	6058	7
213.250687	30.62	71.94	33.90	95.02	6055	18
213.321518	30.43	61.50	32.72	84.92	6059	18
213.392380	28.06	81.63	58.09	116.49	6053	7
213.463196	32.21	66.00	56.32	106.91	6054	7
213.534012	34.02	55.10	51.50	94.92	6053	12
213.604843	34.83	63.38	41.09	96.46	6052	12
213.675690	38.51	54.38	42.87	91.79	6045	15
213.746567	41.25	62.15	61.06	110.27	6046	15
213.817398	39.45	67.43	60.48	112.95	6053	56
213.888214	38.44	54.76	64.04	105.53	6050	48
213.958984	41.82	80.76	51.74	120.02	6035	48
213.997208	23.72	65.50	12.81	73.81	473	48
214.031937	42.65	57.68	42.15	96.03	5451	9
214.099319	40.18	70.02	46.88	103.68	6030	9
214.170151	37.65	67.38	50.93	102.50	6058	7
214.240677	35.26	59.03	36.57	87.06	5993	7
214.311798	34.49	56.27	30.39	82.10	6046	6
214.382645	29.87	49.16	33.99	75.62	6052	9
214.453476	28.75	55.31	43.74	86.77	6054	9
214.524307	29.71	50.84	47.45	84.77	6051	7
214.595123	32.77	51.50	54.18	94.41	6057	7
214.665955	34.44	54.26	47.52	95.00	6045	22
214.736938	40.24	72.50	57.59	117.63	6023	22
214.807663	34.65	64.14	49.00	103.96	6051	15
214.878494	31.71	52.35	55.36	95.01	6049	18
214.949387	40.19	69.09	61.28	113.42	6047	18
214.992355	31.66	110.57	40.52	133.66	1307	18
215.027100	45.81	60.10	42.91	100.27	4620	18
215.089554	40.32	66.68	49.49	103.35	6049	18
215.160416	36.11	112.65	75.73	153.32	6060	15
215.231232	33.25	86.94	44.11	114.47	6057	15
215.302078	35.60	51.37	26.45	75.24	6061	7
215.372925	29.10	44.66	27.85	67.64	6055	7
215.443771	28.08	59.47	44.63	88.85	6051	6
215.514572	29.52	47.38	43.33	81.55	6045	5
215.585403	32.85	46.65	22.15	68.73	6055	5
215.656219	32.58	47.29	29.51	73.12	6051	9
215.727097	37.61	47.30	46.79	93.05	6051	9
215.797943	35.93	59.30	43.94	96.83	6045	15
215.868790	31.70	66.13	45.79	100.03	6051	15

215.939651	34.98	53.34	37.77	86.04	6049	9
215.987503	35.09	70.95	62.36	111.10	2135	9
216.021912	43.75	55.26	52.16	100.76	3735	9
216.079163	41.80	65.37	38.26	96.05	6054	9
216.150024	33.25	80.13	47.96	109.29	6050	9
216.220840	33.49	54.42	30.01	77.78	6056	9
216.291672	31.59	46.41	22.40	66.56	6060	7
216.362503	28.38	55.51	32.26	77.40	6058	7
216.433350	26.12	62.84	44.59	91.84	6048	9
216.504150	28.47	45.35	30.56	69.49	6052	7
216.574982	32.62	46.23	30.84	74.51	6045	7
216.645798	31.99	50.43	29.90	75.18	6050	12
216.716660	34.52	47.57	46.38	90.68	6033	12
216.787552	34.59	50.54	43.31	88.27	6045	12
216.858368	29.53	58.48	39.59	88.01	6051	12
216.929184	34.14	58.09	35.33	86.27	6053	7
216.982269	31.07	45.63	55.90	90.40	3020	7
217.017044	44.32	77.25	30.49	102.32	2908	18
217.069489	40.84	73.37	66.32	121.76	6038	18
217.140274	32.98	93.67	62.73	133.40	6062	15
217.211105	33.56	76.81	44.36	106.48	6056	15
217.281967	34.32	70.17	41.36	99.35	6050	18
217.352783	28.57	56.41	37.45	85.10	6060	18
217.423615	28.73	57.00	43.54	88.64	6059	18
217.494507	33.81	44.12	27.45	71.23	6039	18
217.565262	38.15	68.86	54.56	111.59	6053	15
217.636093	35.95	60.70	49.87	99.22	6053	22
217.706970	38.14	59.73	53.82	104.92	6051	22
217.777802	40.60	75.94	49.11	114.20	6053	18
217.848648	32.60	55.79	34.39	85.75	6047	18
217.919464	35.38	60.58	39.54	91.58	6057	12
217.977417	34.29	76.76	50.03	110.24	3850	12
218.012161	49.25	56.19	38.91	93.21	2080	9
218.059723	36.87	65.95	35.41	94.75	6041	9
218.130554	29.78	63.44	38.01	90.06	6052	15
218.201431	111.03	70.32	59.80	164.94	6003	15
218.272263	29.82	67.67	42.38	96.27	6052	48
218.343063	30.72	70.61	62.66	113.07	6060	48
218.413895	25.37	71.63	52.21	103.65	6051	39
218.484711	29.03	49.99	42.97	82.47	6049	39
218.555527	34.00	67.97	55.12	110.07	6051	18
218.626358	31.36	70.52	66.99	119.70	6047	27
218.697235	34.51	69.72	74.04	124.94	6054	27
218.768066	32.06	65.10	37.78	95.16	6051	15
218.838913	28.93	57.51	49.05	92.49	6056	15
218.909744	35.39	53.02	50.87	93.21	6060	27
218.972565	47.35	76.80	65.20	126.34	4683	27
219.007309	35.78	59.18	57.51	98.46	1248	27
219.050018	43.31	81.49	64.52	128.30	6046	27
219.120850	43.96	99.40	81.54	154.68	6030	27
219.191742	36.50	108.04	67.05	145.22	5827	32
219.262482	40.97	60.09	32.23	87.01	6059	9
219.333282	34.01	44.96	25.74	69.40	6041	9
219.404160	29.89	52.22	38.95	79.91	6057	9
219.475006	29.30	49.66	42.35	79.57	6054	9
219.545837	32.71	55.55	33.33	81.04	6047	15
219.616638	33.50	59.36	41.45	90.53	6053	15
219.687531	30.36	53.72	34.70	83.08	6048	12
219.758347	31.75	58.38	39.34	89.65	6052	9
219.829178	30.66	57.18	39.26	86.20	6057	9
219.900024	33.45	62.49	51.34	98.89	6058	18
219.967728	36.85	58.01	37.77	87.25	5516	18
220.002441	45.57	85.83	21.85	100.08	414	5
220.040283	39.67	60.89	38.49	90.58	6052	5
220.111115	36.81	62.58	35.43	89.46	6055	5
220.181931	37.32	51.68	29.05	77.19	6042	4
220.252762	35.62	54.46	29.73	78.14	6056	6
220.323593	31.13	51.58	26.08	74.57	6055	6
220.394440	27.72	58.78	41.40	86.41	6054	12
220.465485	28.66	61.98	63.70	109.09	5938	12
220.536118	29.45	45.89	40.24	78.25	6051	12

220.606949	32.88	49.37	23.83	71.32	6055	12
220.677765	31.83	52.71	26.54	75.58	6045	5
220.748627	30.24	55.57	41.94	85.82	6049	5
220.819458	31.15	50.89	34.79	78.97	6058	7
220.890305	33.11	51.10	42.92	83.94	6059	7
220.961121	39.91	54.24	38.19	86.44	6055	7
220.998245	22.97	67.25	11.90	73.19	294	7
221.032639	41.65	61.03	42.31	95.16	5564	6
221.100677	42.62	60.03	35.82	90.57	6055	6
221.171539	38.38	50.64	32.07	79.15	6062	5
221.242355	39.27	44.20	27.23	71.03	6059	5
221.313187	35.26	57.43	29.64	82.28	6061	7
221.384033	30.22	40.39	29.88	66.49	6061	5
221.454865	27.37	44.41	24.50	64.18	6058	5
221.525681	31.10	58.51	33.71	82.72	6049	9
221.596512	31.25	51.67	28.33	74.46	6057	9
221.667419	30.04	46.77	44.58	82.69	6040	6
221.738251	25.78	41.67	34.31	69.44	6038	6
221.809052	30.15	56.80	36.24	82.99	6052	7
221.879883	31.20	52.89	38.27	81.64	6059	7
221.950714	37.48	51.50	34.19	80.34	6058	7
221.993057	30.56	60.51	51.88	93.33	1184	7
222.027802	42.56	63.69	46.68	101.09	4743	6
222.090973	39.29	65.04	37.43	94.62	6057	6
222.161789	38.22	60.90	30.65	85.81	6042	6
222.232620	39.17	45.56	25.13	70.34	6055	6
222.303467	37.51	50.63	21.08	72.99	6064	4
222.374313	30.53	40.89	32.86	68.95	6059	4
222.445145	28.11	45.27	28.39	67.56	6055	4
222.515945	30.26	45.87	30.42	70.67	6047	4
222.586777	34.26	51.38	25.30	74.34	6056	4
222.657669	31.55	45.36	25.93	69.37	6042	4
222.728546	28.07	41.76	40.75	74.86	6039	4
222.799332	28.62	45.33	37.31	75.18	6050	4
222.870178	29.70	53.42	43.02	84.54	6058	4
222.941010	33.58	64.07	36.30	89.16	6054	9
222.988190	43.03	59.53	59.42	103.74	2013	9
223.022934	31.78	52.42	18.39	70.99	3896	4
223.081253	39.17	57.51	35.97	87.82	6055	4
223.141571	42.66	61.69	47.61	98.57	4140	12
223.222916	35.61	69.75	49.65	102.48	6051	12
223.293869	37.10	98.99	73.40	142.41	5986	39
223.364609	29.60	77.13	55.23	110.34	6054	39
223.435425	25.66	93.29	65.17	128.33	6054	27
223.506256	30.53	54.41	70.09	108.29	6043	32
223.577072	31.72	67.92	55.38	104.95	6050	32
223.647888	30.50	59.73	55.17	100.05	6037	15
223.718735	31.81	63.30	63.67	110.71	6042	15
223.789612	28.65	61.31	53.77	101.32	6052	18
223.860458	29.86	65.23	61.24	108.21	6053	18
223.931290	44.01	88.16	69.76	144.20	6058	56
223.983322	52.61	111.93	77.60	167.68	2843	56
224.018082	45.62	66.13	68.48	123.58	3079	67
224.071533	52.29	105.91	65.38	156.07	6046	67
224.142380	109.29	128.13	79.63	229.62	6057	67
224.213257	51.54	179.80	118.19	235.85	6045	67
224.284012	45.45	114.97	90.44	175.26	6056	48
224.354813	35.81	108.55	75.13	153.56	6052	48
224.425690	34.03	86.72	72.55	132.18	6055	32
224.496552	34.97	92.35	85.26	151.10	6050	32
224.567352	38.10	76.09	72.22	133.54	6051	32
224.638199	37.30	72.63	73.90	131.11	6056	12
224.709106	38.28	66.84	52.28	112.07	6039	12
224.779892	40.45	88.67	58.72	128.11	6052	48
224.850739	37.99	99.87	70.54	148.35	6052	48
224.921600	40.51	101.09	79.20	155.23	6037	67
224.978470	32.51	93.22	78.16	138.97	3665	67
225.013184	50.32	89.26	43.19	123.17	2256	48
225.061813	36.90	77.82	52.03	113.31	6053	48
225.132553	52.99	167.33	195.15	282.72	5983	154
225.203522	40.05	140.67	110.54	201.42	6025	154

225.274323	60.85	216.16	174.85	309.82	5995	179
225.345108	80.96	229.42	174.24	330.58	6038	179
225.416031	68.80	197.88	155.01	289.38	6026	179
225.486832	63.43	154.36	129.64	244.81	6029	179
225.557877	62.09	148.95	135.94	250.82	5965	154
225.628479	62.27	147.50	154.47	260.21	6048	154
225.699371	61.97	155.64	104.07	232.09	6030	154
225.770187	59.56	122.86	89.64	191.32	6044	94
225.841049	44.42	130.14	78.79	180.20	6043	94
225.911880	54.08	102.53	66.44	154.79	6045	22
225.973602	61.98	84.57	72.41	152.60	4501	22
226.007996	37.59	84.17	32.94	105.37	1367	32
226.051407	52.64	77.82	44.02	117.69	6051	32
226.122238	55.07	76.30	50.42	119.45	6055	32
226.193130	47.13	72.99	36.24	103.40	6030	67
226.263931	47.63	60.03	30.98	90.96	6047	15
226.334763	41.17	50.67	26.61	81.48	6050	15
226.405563	38.36	48.06	28.47	78.40	6049	6
226.476379	37.59	50.52	28.50	79.75	6047	6
226.547195	40.40	56.35	27.26	85.44	6050	9
226.618073	40.92	61.95	27.43	90.78	6047	9
226.688904	42.92	54.98	29.73	90.13	6053	6
226.759766	38.77	48.64	35.54	85.65	6047	6
226.830597	40.95	50.00	35.04	86.50	6056	6
226.901413	46.37	51.83	38.53	92.06	6061	12
226.968430	51.38	50.08	33.50	90.32	5396	12
227.003143	52.91	99.98	38.53	121.15	531	3
227.041672	52.05	58.07	46.66	104.10	6052	3
227.112473	50.51	57.88	46.66	101.17	6035	3
227.254242	49.00	42.01	42.82	87.70	6039	3
227.324997	43.39	42.44	43.17	85.22	6045	3
227.395844	38.04	44.74	45.59	86.13	6059	4
227.466660	34.28	53.29	49.16	92.08	6053	4
227.537491	35.99	58.74	55.50	100.09	6038	9
227.608337	36.56	56.77	53.74	100.34	6054	9
227.679199	35.61	49.46	52.96	95.44	6052	18
227.750076	31.33	46.76	65.95	102.01	6041	22
227.820862	38.57	62.40	60.69	108.43	6049	22
227.891724	40.34	49.80	60.87	102.75	6053	32
227.962067	47.41	58.41	67.11	117.17	5965	32
227.998978	25.88	104.03	24.70	111.34	115	32
228.032562	51.00	56.61	45.67	102.17	5322	15
228.103180	49.96	70.52	42.24	106.14	4815	15
228.173599	54.50	65.42	48.30	108.78	6049	22
228.244415	54.71	51.80	27.49	87.17	6057	22
228.315262	50.10	49.34	22.61	80.95	6060	4
228.386108	45.72	58.90	36.85	92.88	6058	6
228.456940	42.87	58.83	46.95	98.74	6054	6
228.527771	42.65	51.03	35.35	85.87	6049	5
228.598587	41.87	59.01	23.08	86.62	6057	5
228.669403	43.31	52.47	27.55	82.87	6042	5
228.740280	34.73	40.08	33.64	72.63	6047	5
228.811127	38.00	43.64	35.17	77.63	6056	6
228.882004	44.36	44.33	37.19	82.73	6050	5
228.952789	50.98	47.71	32.58	86.03	6059	5
228.994080	41.37	49.10	40.14	84.62	1009	5
229.028824	57.78	55.56	43.89	101.71	4920	7
229.093048	57.03	61.69	45.47	105.54	6058	7
229.163910	51.19	54.87	34.29	90.94	6047	7
229.234711	51.90	57.63	31.61	93.23	6047	7
229.305557	49.81	49.92	21.44	81.89	6063	9
229.376373	42.35	64.29	38.46	94.78	6054	5
229.447220	41.27	54.87	42.05	91.43	6063	5
229.518082	40.33	63.47	45.09	100.51	6042	7
229.588867	36.12	58.73	45.25	94.17	6057	7
229.659714	40.44	49.23	25.94	79.22	6048	5
229.730560	32.98	42.20	29.10	69.71	6054	5
229.801407	34.08	42.41	39.95	76.97	6055	6
229.872238	39.58	40.75	37.92	77.13	6058	6
229.943085	49.26	47.10	34.87	86.15	6058	7
229.989243	58.32	56.24	55.65	108.39	1844	7

230.023651	46.65	45.52	29.65	80.46	4031	7
230.082611	54.89	58.64	36.55	97.06	6054	7
230.140991	53.89	61.08	46.03	102.69	3928	12
230.295349	48.90	73.02	45.30	112.89	6026	6
230.365967	41.93	53.17	37.33	88.94	6062	6
230.436813	38.96	50.80	33.25	82.74	6059	7
230.507614	39.30	48.58	34.35	82.33	6050	6
230.578445	38.92	53.27	24.80	81.06	6056	6
230.649277	38.59	41.17	44.56	82.04	6058	4
230.720154	35.75	51.13	70.79	103.50	6047	4
230.790970	37.98	52.74	64.32	99.95	6049	5
230.861893	36.36	46.69	51.57	87.87	6040	5
230.932617	39.19	43.16	42.17	81.10	6039	5
230.984009	52.12	44.38	14.71	76.34	2726	5
231.018768	32.67	49.78	38.97	80.98	3205	6
231.072906	43.30	57.33	27.01	85.59	6055	6
231.143753	42.66	50.37	33.55	83.10	6063	5
231.214584	41.10	38.96	32.61	74.55	6051	5
231.285416	42.54	36.25	26.43	71.35	6064	2
231.356247	34.15	35.01	21.68	63.37	6060	2
231.427078	29.81	38.47	20.12	61.00	6054	2
231.497894	31.79	39.00	20.46	61.90	6052	2
231.568726	35.69	44.25	18.12	66.72	6055	2
231.639557	35.59	48.65	20.10	70.86	6051	3
231.710434	35.61	41.10	28.16	69.88	6056	3
231.781250	36.76	42.00	33.47	72.52	6048	3
231.852158	35.11	41.16	37.72	74.86	6046	3
231.922943	37.99	43.32	35.73	76.03	6060	3
231.979111	41.65	48.33	20.72	75.59	3544	3
232.013870	37.08	47.71	48.70	82.85	2374	4
232.063187	40.94	52.99	37.12	87.19	6053	4
232.133942	41.08	56.69	30.75	86.18	5980	2
232.204819	39.82	39.38	31.10	73.49	6049	2
232.275696	42.85	36.95	28.54	71.70	6064	2
232.346512	34.24	38.65	23.50	65.57	6044	2
232.417374	28.26	43.71	22.63	65.24	6056	3
232.488190	30.89	38.14	15.46	58.28	6049	3
232.559006	33.34	44.06	15.39	63.49	6051	4
232.629837	35.74	47.56	18.56	70.31	6055	9
232.700699	34.50	47.80	31.15	75.38	6054	9
232.771545	33.85	45.61	42.56	77.89	6051	5
232.842377	33.86	45.23	43.89	79.18	6056	5
232.913208	36.96	45.68	37.83	78.54	6051	4
232.974289	42.77	57.79	35.81	90.17	4386	4
233.009033	33.13	32.78	30.44	59.82	1546	0
233.053467	40.81	51.19	42.62	86.17	6050	0
233.124313	43.30	53.07	36.66	88.37	6060	0
233.195145	39.34	36.32	35.02	72.43	6057	2
233.265961	43.21	35.00	25.80	69.40	6062	0
233.336792	34.50	34.25	19.51	61.80	6056	0
233.407623	28.84	34.38	19.35	57.24	6056	6
233.478455	29.25	40.80	23.43	63.42	6051	6
233.549301	34.43	41.57	17.70	64.32	6053	3
233.620117	34.87	48.62	21.39	70.30	6053	3
233.690979	34.19	49.17	38.35	79.20	6051	9
233.761826	32.45	45.52	47.43	80.57	6050	7
233.832657	32.91	44.52	37.31	74.26	6054	7
233.903488	36.29	45.66	48.31	85.55	6053	4
233.969452	39.13	53.97	47.01	92.07	5221	4
234.004166	50.09	62.32	36.03	89.55	712	7
234.043747	38.38	57.15	41.02	90.44	6048	7
234.114594	39.85	59.38	50.18	101.28	6041	7
234.185379	35.99	91.11	65.30	129.41	6039	18
234.256256	40.97	62.91	53.38	104.39	6047	6
234.327087	35.14	50.72	46.62	90.63	6062	6
234.397919	30.57	48.84	44.07	86.36	6051	12
234.468750	32.83	50.89	52.90	92.24	6053	12
234.539566	32.08	48.81	48.54	90.04	6053	6
234.610413	31.43	60.70	44.96	95.61	6050	6
234.681213	34.10	62.49	41.97	93.08	6043	6
234.752121	31.23	59.24	46.88	95.98	6047	7

234.822922	33.34	57.97	47.29	97.24	6056	7
234.893753	41.01	60.94	59.86	107.98	6051	22
234.964600	43.84	63.40	51.53	104.00	6059	22
235.034393	44.08	60.62	38.34	94.23	5873	5
235.104156	44.58	67.38	34.80	96.02	6057	5
235.174988	42.84	57.25	29.27	83.88	6062	5
235.245804	44.18	51.81	30.45	80.93	6059	5
235.316666	38.08	39.91	20.12	65.35	6057	3
235.387497	30.90	38.25	22.29	61.47	6059	0
235.458328	28.93	39.82	21.59	61.12	6058	0
235.529160	31.80	45.89	24.17	69.19	6049	2
235.599991	33.93	50.26	23.25	72.79	6057	2
235.670853	30.70	45.20	21.71	66.38	6046	2
235.741730	29.15	42.74	29.20	67.12	6039	2
235.812531	30.27	42.71	28.80	67.26	6053	0
235.883362	32.42	45.28	33.72	72.93	6060	3
235.954163	38.41	47.57	28.70	76.30	6044	3
235.994766	22.82	47.97	23.37	62.12	888	3
236.029541	42.01	49.62	38.84	86.77	5044	2
236.094437	39.77	51.61	43.89	89.22	6055	2
236.165283	38.53	50.95	39.89	83.24	6043	0
236.236099	42.86	40.95	41.85	81.66	6059	0
236.306961	34.59	40.98	41.02	76.06	6054	3
236.377792	27.53	51.82	64.73	97.37	6055	7
236.448639	30.26	63.57	67.78	111.11	6050	7
236.519440	30.09	67.93	87.33	128.79	6050	9
236.590271	28.95	63.42	65.36	110.16	6052	9
236.661102	29.92	56.03	61.42	99.29	6053	18
236.807220	37.79	53.89	54.56	98.20	5299	9
236.873657	34.48	51.71	56.05	97.37	6055	9
236.944458	38.43	48.83	53.45	96.16	6053	5
236.989899	58.03	60.67	87.02	136.91	1697	5
237.024658	32.10	51.71	25.91	73.99	4200	9
237.084717	40.63	60.53	35.26	89.67	6047	9
237.155518	37.83	56.39	35.80	84.88	6041	15
237.226593	39.20	79.28	59.01	117.23	5970	15
237.297241	34.40	63.43	29.11	87.81	6062	12
237.368073	29.14	44.55	23.89	64.72	6060	12
237.438873	25.25	42.68	22.79	61.40	6054	7
237.509705	26.92	46.77	26.64	68.26	6051	6
237.580551	31.91	53.16	24.33	73.70	6053	6
237.651367	29.59	57.02	28.30	78.48	6051	5
237.722183	31.47	51.42	32.68	77.73	6038	5
237.793076	33.87	47.35	35.30	78.17	6055	4
237.863937	32.22	46.55	35.14	76.95	6058	4
237.934738	35.85	52.00	33.11	82.72	6054	3
237.985062	47.58	55.39	48.37	98.26	2548	3
238.019821	27.29	56.24	18.19	71.95	3376	0
238.074982	39.80	66.03	32.11	91.27	6051	0
238.145782	42.09	67.19	36.09	95.90	6055	4
238.216660	39.42	44.98	22.94	69.92	6061	4
238.287491	39.81	39.19	18.20	65.23	6060	2
238.358322	31.61	38.30	21.38	61.24	6060	2
238.429153	28.84	41.22	20.73	61.52	6051	2
238.500031	29.39	44.28	26.63	67.26	6045	3
238.570801	33.01	48.64	22.92	69.96	6048	3
238.641663	32.87	51.80	24.97	72.86	6049	3
238.712509	29.27	50.67	32.39	75.97	6047	3
238.783340	29.97	45.62	34.92	74.93	6054	6
238.854187	31.01	51.39	34.00	77.91	6054	6
238.925018	35.93	49.01	33.60	79.55	6047	4
238.979874	40.03	58.25	42.75	91.49	3213	4
239.014557	37.06	56.16	31.52	83.38	2449	4
239.064590	40.02	59.34	33.55	88.52	6053	4
239.135422	38.78	61.49	28.70	86.82	6052	5
239.206238	38.64	60.47	31.25	86.25	6049	5
239.277069	39.15	63.50	36.52	90.77	6060	6
239.347916	29.36	68.54	42.73	96.18	6059	6
239.418732	27.18	47.94	32.93	72.55	6047	5
239.489578	29.15	51.54	33.07	76.17	6051	5
239.560394	30.53	49.08	35.60	78.65	6050	6

239.631256	31.63	47.17	28.46	71.51	6054	5
239.702103	29.52	49.17	25.32	71.59	6050	5
239.772919	28.90	43.27	31.13	69.66	6051	3
239.843765	30.72	43.70	28.69	68.61	6053	3
239.914612	35.32	45.38	32.30	74.44	6060	3
239.974991	42.87	55.66	42.78	92.04	4261	3
240.009735	31.90	32.69	16.93	54.08	1664	7
240.054855	40.55	61.28	41.49	94.31	6053	7
240.125671	43.97	58.09	29.99	87.68	6050	4
240.196533	39.72	49.85	26.35	75.61	6063	4
240.267365	41.77	44.93	19.97	69.69	6064	3
240.338135	34.62	42.10	19.93	64.92	6048	3
240.409058	29.58	41.57	20.58	61.77	6044	4
240.479843	30.01	46.71	27.07	69.27	6055	4
240.550659	32.73	47.64	23.55	70.82	6051	12
240.621521	32.68	58.06	36.13	84.77	6053	12
240.692413	30.37	49.98	30.95	75.23	6043	7
240.763199	26.38	47.32	33.35	71.05	6053	7
240.834045	27.10	48.10	35.17	74.81	6052	7
240.904877	32.03	43.41	37.47	74.98	6058	9
240.970154	36.73	50.56	36.82	81.51	5100	9
241.004868	44.80	38.34	14.50	64.15	830	9
241.045105	39.81	63.57	40.87	95.79	6046	9
241.115921	42.87	57.99	43.73	96.56	6045	9
241.186798	38.14	51.92	29.17	79.17	6047	5
241.257614	39.34	52.44	21.81	74.70	6061	7
241.328476	31.14	56.85	23.26	77.41	6062	7
241.399338	28.09	56.88	44.49	86.39	6046	18
241.470123	27.42	72.16	64.75	111.74	6055	18
241.540955	31.53	60.26	71.05	113.77	6051	27
241.611801	34.26	53.28	32.76	81.33	6055	27
241.682663	31.43	52.72	37.62	83.29	6043	48
241.753479	35.42	67.28	79.96	128.62	6049	56
241.824310	31.18	58.80	40.52	88.55	6051	56
241.895172	35.36	56.93	62.76	103.77	6057	48
241.965286	48.09	69.06	70.02	124.86	5923	48
242.035477	55.75	116.87	85.32	176.28	6041	67
242.106277	50.06	88.34	58.66	132.32	6046	67
242.177109	42.76	91.69	82.01	144.31	6053	39
242.247910	46.59	99.15	80.32	151.53	6057	39
242.318756	40.23	64.85	30.55	90.85	6057	48
242.389587	35.77	58.95	46.45	92.77	6055	27
242.460419	34.15	71.24	43.99	102.18	6061	27
242.531250	32.80	56.62	46.76	92.94	6049	15
242.602081	35.68	50.35	27.77	76.92	6052	15
242.672913	36.80	67.64	55.65	107.39	6049	32
242.743744	29.63	51.56	54.04	92.50	6052	32
242.814590	41.32	71.52	78.65	131.14	6054	39
242.885452	38.56	54.60	49.36	94.14	6058	15
242.956268	47.26	53.71	47.23	97.52	6046	15
242.995819	23.68	52.04	25.98	69.66	711	15
243.030228	53.50	60.94	65.60	118.98	5162	22
243.095825	50.74	65.70	58.98	114.25	6054	22
243.166672	45.00	61.39	40.90	95.12	6061	15
243.237518	46.55	50.97	23.74	78.84	6046	15
243.308350	41.46	47.11	25.23	75.54	6060	7
243.379196	35.52	46.07	36.92	78.75	6045	12
243.450012	30.48	50.15	34.04	75.90	6055	12
243.520828	33.39	47.72	28.58	73.39	6048	9
243.591629	34.43	54.98	31.50	81.18	6036	9
243.662537	31.85	43.25	25.76	68.24	6040	9
243.733353	28.13	44.98	33.78	71.74	6054	9
243.804184	30.46	43.44	32.98	71.08	6055	7
243.875031	34.71	55.58	47.28	89.73	6058	18
243.945847	43.26	49.41	45.04	91.19	6056	18
243.990616	57.51	52.99	44.94	101.21	1599	18
244.025345	36.51	51.74	29.21	77.76	4321	18
244.086090	46.42	65.89	55.41	108.28	6050	18
244.156937	44.87	64.36	43.87	99.98	6060	12
244.227829	43.64	43.36	24.19	71.61	6051	12
244.298615	40.90	57.47	27.84	84.12	6064	9

244.369476	32.45	51.67	36.81	80.96	6055	9
244.440308	30.67	57.42	57.46	96.93	6040	18
244.511093	32.33	60.89	53.39	99.04	6047	15
244.581955	33.18	52.11	42.62	86.37	6047	15
244.652771	33.93	51.97	37.72	82.82	6053	12
244.723618	29.93	48.96	47.57	86.59	6049	12
244.794464	32.59	51.15	43.98	84.46	6050	7
244.865326	33.18	58.29	41.97	86.76	6057	7
244.936203	37.47	66.74	48.39	102.99	6034	18
244.985764	47.47	68.91	59.03	113.33	2429	18
245.020523	32.80	62.08	35.45	87.70	3500	18
245.076385	44.03	68.45	47.33	105.28	6057	18
245.147217	39.57	67.51	35.35	95.86	6063	12
245.218063	41.27	60.86	38.02	91.56	6060	12
245.288895	39.75	65.45	42.55	99.76	6058	22
245.359665	28.97	45.21	37.11	75.19	6047	22
245.430573	28.19	49.32	27.19	70.74	6060	18
245.501343	29.97	48.15	47.78	85.91	6030	12
245.572205	34.59	48.61	32.12	77.71	6056	12
245.643051	34.02	52.18	31.57	78.88	6057	12
245.713898	33.96	56.61	44.50	92.08	6051	12
245.784744	39.63	64.82	54.41	106.50	6056	22
245.855591	33.24	63.60	35.33	88.76	6047	22
245.926437	36.45	55.15	35.03	84.23	6054	12
245.980942	42.92	60.16	45.12	96.00	3249	12
246.015594	38.79	64.50	58.64	109.60	2662	27
246.066650	40.21	66.75	63.98	112.78	6052	27
246.137466	41.63	108.03	68.20	150.02	6045	22
246.208374	35.50	95.38	51.61	124.58	6048	22
246.279144	39.38	95.31	68.28	139.40	6052	32
246.349976	31.92	95.24	55.53	129.73	6053	32
246.420776	36.25	94.77	74.23	140.41	6037	32
246.491669	35.46	78.78	53.91	115.63	6046	32
246.562500	36.36	76.91	60.85	121.91	6051	27
246.633331	38.07	66.68	49.53	106.21	6055	27
246.704208	39.94	72.17	57.95	118.22	6048	27
246.775024	40.95	59.33	36.96	92.68	6053	9
246.845871	35.13	48.40	34.58	78.88	6055	9
246.916687	39.07	48.88	45.26	87.07	6049	9
246.976059	41.34	57.84	50.85	99.04	4087	9
247.010757	32.72	43.69	13.79	62.38	1842	3
247.056946	40.07	53.63	33.49	84.46	6045	3
247.127777	42.72	60.41	29.59	87.65	6064	7
247.198593	41.25	59.77	25.65	83.03	6053	7
247.269440	40.79	40.71	19.37	66.09	6061	3
247.340225	33.36	38.31	20.74	62.27	6049	3
247.411118	28.67	38.88	21.07	60.54	6057	3
247.481934	31.07	38.53	23.52	63.80	6054	3
247.552795	33.72	48.19	24.22	71.93	6035	5
247.623596	35.76	47.56	27.02	74.91	6054	5
247.694458	32.11	56.96	24.58	78.53	6053	6
247.765274	30.98	41.51	32.50	70.51	6049	15
247.835968	33.32	44.18	49.55	84.70	6026	15
247.908905	34.54	65.61	50.21	102.94	4028	12
247.970551	40.14	57.69	40.86	89.96	4734	12
248.005432	35.78	53.25	10.76	66.82	907	5
248.047760	47.96	54.73	37.97	91.47	5820	5
248.117340	51.47	56.63	34.64	91.61	6057	5
248.188187	47.95	45.88	28.61	79.76	6057	4
248.259018	48.66	47.54	22.50	76.47	6059	6
248.329819	38.89	55.65	32.12	85.26	6053	6
248.400681	34.86	54.59	40.01	85.23	6058	6
248.471512	34.66	40.60	28.02	70.05	6056	6
248.542389	50.21	67.95	27.02	101.08	6041	12
248.613144	37.92	55.50	27.37	80.50	6053	12
248.684021	32.63	48.83	27.53	73.34	6052	15
248.754883	32.74	65.36	56.40	105.26	6053	67
248.825729	39.54	79.30	78.93	139.77	6046	67
248.896545	41.90	77.51	76.01	135.74	6058	27
248.966003	45.37	66.14	57.49	112.16	5813	27
249.000687	45.14	121.50	29.75	133.07	116	5

249.036789	44.95	71.43	46.09	106.80	6052	5
249.107620	45.01	64.23	56.25	108.00	6057	5
249.178467	38.30	64.92	64.09	111.62	6045	6
249.249283	40.04	58.46	63.40	108.45	6060	6
249.320099	33.26	51.29	66.06	103.23	6055	5
249.390961	27.19	52.92	68.11	102.38	6059	4
249.461792	27.29	51.24	72.00	105.13	6058	4
249.532639	40.77	48.03	59.56	96.22	6052	5
249.603439	40.09	46.23	78.83	110.84	6052	5
249.674301	37.33	46.58	57.73	94.16	6052	9
249.745148	34.45	51.29	70.41	103.75	6039	9
249.815994	35.94	60.81	41.72	90.98	6050	15
249.886810	39.19	56.60	39.70	87.12	6056	9
249.957657	43.00	52.46	34.73	83.65	6058	9
249.996506	21.41	48.80	9.76	56.87	592	9
250.031204	46.17	56.57	24.17	85.38	5328	5
250.097900	47.86	55.17	26.03	85.64	6052	5
250.168732	43.84	42.88	28.63	75.77	6054	3
250.239563	46.02	39.79	31.36	76.39	6057	3
250.310410	43.13	37.37	30.30	73.76	6060	5
250.381256	35.76	40.69	30.11	70.85	6060	2
250.452042	33.13	37.57	23.76	64.17	6044	2
250.522888	34.92	43.15	21.19	66.53	6047	9
250.593719	37.83	47.52	30.70	78.30	6050	9
250.664566	35.61	49.90	29.21	77.64	6052	27
250.735428	28.78	56.74	56.23	95.09	6051	27
250.806259	28.63	54.25	48.29	90.52	6039	22
250.877106	32.10	51.49	40.16	81.89	6058	27
250.947922	41.50	55.96	38.39	89.56	6059	27
250.991730	49.68	74.90	25.82	99.50	1416	27
251.026398	38.28	50.58	43.98	85.64	4490	15
251.088196	45.89	68.93	47.85	107.90	6056	15
251.159012	44.54	83.18	57.56	121.81	6054	12
251.229843	45.81	59.76	59.11	106.57	6046	12
251.300690	43.80	62.33	53.04	102.16	6061	15
251.371521	33.77	59.86	55.68	100.82	6058	15
251.442368	33.89	67.76	45.62	100.60	6055	12
251.513168	33.78	61.17	55.95	101.13	6052	12
251.584000	36.36	54.73	53.44	97.24	6051	12
251.654846	37.74	49.51	47.40	92.11	6041	18
251.725677	33.03	60.10	55.71	102.41	6051	18
251.796539	36.01	55.66	40.30	87.38	6051	18
251.867386	36.35	57.62	48.70	92.75	6055	18
251.938400	40.04	57.40	58.13	107.53	6001	18
251.986786	53.02	77.27	68.31	131.35	2233	18
252.021210	39.63	60.53	33.23	90.19	3617	15
252.077759	43.41	68.21	36.16	97.45	6057	15
252.148590	43.69	57.28	36.87	89.81	6049	7
252.219437	44.44	49.87	38.20	84.95	6056	7
252.290283	42.59	49.24	41.29	87.97	6048	12
252.361130	34.29	55.85	56.27	99.24	6050	12
252.431915	31.42	82.24	71.42	128.30	6049	22
252.502762	30.49	64.83	49.11	99.03	6049	22
252.573593	35.93	61.97	65.80	112.24	6057	22
252.644409	33.65	54.59	40.72	87.99	6050	22
252.715302	29.33	54.60	45.38	87.95	6045	22
252.786118	32.70	50.01	40.32	82.25	6057	15
252.856964	33.36	50.42	46.22	87.51	6046	15
252.927826	40.09	54.12	53.43	99.59	6055	22
252.981583	47.45	63.06	57.64	108.63	3138	22
253.016357	35.79	59.49	41.51	90.87	2787	9
253.068039	41.74	61.01	33.22	88.67	6052	9
253.138809	43.59	59.77	31.20	87.51	6050	7
253.209717	42.81	55.74	27.55	82.71	6054	7
253.280533	40.53	53.88	22.01	76.94	6050	6
253.351395	32.04	42.97	19.97	64.73	6058	6
253.422226	27.44	42.06	21.09	61.27	6059	5
253.493042	31.54	44.54	26.81	69.03	6056	5
253.563965	34.74	45.66	23.12	70.41	5990	7
253.634720	32.95	54.17	26.21	76.08	6053	4
253.705566	32.53	49.44	24.61	72.23	6054	4

253.776413	33.68	43.72	29.47	70.71	6055	2
253.847382	32.02	44.32	28.57	68.85	6020	2
253.918060	35.37	48.71	31.73	76.51	6057	0
253.977066	40.81	54.89	37.67	88.15	3901	0
254.011459	35.00	41.29	10.77	59.18	1961	0
254.058319	38.66	55.00	29.65	81.25	6050	0
254.129150	41.85	58.26	28.32	84.83	6050	2
254.199982	41.14	50.13	25.64	76.10	6055	2
254.270798	41.01	45.18	18.12	68.83	6059	3
254.341660	31.85	42.13	20.27	64.11	6057	3
254.412506	26.15	44.70	22.30	63.22	6059	6
254.483322	29.12	46.20	36.39	73.85	6057	6
254.554184	33.77	53.09	25.23	76.58	6033	4
254.625000	34.00	52.37	26.55	75.28	6052	5
254.695862	30.23	49.49	26.62	70.88	6042	5
254.766693	30.04	44.71	30.46	69.12	6054	6
254.837540	31.55	42.84	34.35	72.46	6055	6
254.908340	35.16	51.24	34.76	80.07	6049	5
254.971863	38.21	52.40	34.02	82.82	4799	5
255.006607	36.83	36.18	9.11	55.87	1129	0
255.048630	38.77	57.01	30.23	83.63	6055	0
255.119446	41.29	62.42	29.85	88.49	6056	0
255.190292	38.94	49.40	25.48	74.46	6048	0
255.261078	37.99	43.67	19.11	66.09	6055	2
255.331940	31.98	41.95	20.44	63.43	6062	2
255.402756	26.41	43.19	18.76	60.97	6054	4
255.473587	28.23	44.96	19.97	64.41	6054	4
255.544510	31.67	49.51	20.16	68.88	6025	5
255.615265	32.72	50.31	23.16	71.92	6057	5
255.686081	28.82	50.93	28.58	72.50	6043	9
255.756943	29.41	45.78	47.74	82.79	6048	5
255.827805	26.93	47.13	37.11	74.05	6056	5
255.898636	31.87	46.85	39.36	77.50	6059	6
255.967087	37.42	46.04	37.02	79.55	5630	6
256.001404	42.74	63.38	19.56	79.37	235	7
256.038147	39.77	63.62	44.70	97.80	6041	7
256.109009	43.24	65.28	42.44	99.59	6049	7
256.179871	38.98	81.58	69.62	126.77	6057	18
256.250702	39.51	58.45	37.03	88.20	6062	12
256.321533	34.92	50.96	21.21	71.87	6058	12
256.392365	29.18	57.26	38.85	84.74	6054	27
256.463165	33.51	67.00	59.02	107.81	6049	27
256.533997	36.41	77.85	65.36	123.81	6042	32
256.604828	34.73	77.38	66.37	123.85	6038	32
256.675659	34.79	73.54	56.83	114.57	6038	15
256.746552	36.88	76.41	61.67	121.98	6049	15
256.817383	37.84	72.05	56.59	118.11	6051	32
256.888214	40.33	64.68	62.35	114.72	6059	27
256.959015	43.92	54.14	38.98	92.21	6046	27
256.997162	22.37	88.46	14.82	94.63	423	27
257.031952	54.11	73.62	60.01	122.40	5460	27
257.099304	63.00	77.68	66.80	134.70	6054	27
257.170105	54.24	88.46	66.58	135.63	6045	22
257.240936	49.60	71.51	39.58	105.25	6059	22
257.311798	47.51	48.22	19.68	77.12	6062	6
257.382629	41.00	44.33	24.54	72.25	6061	3
257.453461	35.91	43.42	23.21	69.58	6052	3
257.524292	39.36	50.67	25.01	77.55	6046	5
257.595123	38.96	53.26	22.87	79.42	6057	5
257.665955	38.50	46.00	25.88	74.77	6051	5
257.737091	30.75	36.45	27.66	64.05	5996	5
257.807617	32.99	38.91	30.67	67.38	6041	4
257.878479	38.00	40.18	40.14	77.29	6058	6
257.949310	45.40	45.27	44.20	88.23	6052	6
257.992371	43.55	56.14	41.03	89.61	1307	6
258.027100	50.60	48.55	33.57	87.23	4622	4
258.089569	52.48	62.50	42.40	101.54	6057	4
258.160400	48.39	58.75	35.57	92.44	6057	7
258.231201	50.52	57.99	36.89	94.31	6054	7
258.302094	43.61	62.38	26.52	88.54	6063	6
258.372925	37.76	60.67	29.98	85.15	6060	6

258.443756	34.97	51.39	23.55	73.50	6060	3
258.514618	34.99	47.50	24.80	72.66	6043	3
258.585388	37.73	55.78	24.55	80.86	6055	3
258.656250	36.33	48.38	36.15	81.00	6057	4
258.727112	29.85	42.59	40.64	76.68	6049	4
258.797943	30.23	44.46	39.10	75.80	6056	4
258.868774	32.05	46.26	36.15	74.86	6053	4
258.939606	39.35	51.33	38.35	83.15	6055	4
258.987488	47.32	57.94	51.57	98.66	2137	4
259.022247	36.87	52.00	27.61	77.60	3793	2
259.079926	43.38	60.03	35.68	91.54	6047	2
259.150696	41.02	62.14	30.79	89.03	6062	12
259.221588	38.54	54.84	23.42	77.65	6038	12
259.292358	37.51	46.14	17.49	67.67	6060	3
259.363159	29.85	43.01	22.21	63.75	6056	3
259.434021	26.28	42.60	18.94	59.77	6054	4
259.504852	30.04	45.99	23.01	66.88	6054	4
259.575714	33.58	52.62	22.55	73.84	6050	4
259.646515	31.34	52.33	26.00	73.90	6041	6
259.717346	27.41	47.62	25.32	67.37	6050	6
259.788208	28.56	45.99	32.34	69.73	6049	18
259.859009	28.48	50.79	53.61	90.92	6037	18
259.929901	38.98	70.25	75.24	127.12	6056	48
259.982635	45.53	70.12	59.59	118.51	2959	48
260.017029	36.19	72.91	65.94	125.20	2908	22
260.069427	42.12	77.97	53.31	118.95	6054	22
260.140228	40.38	63.11	42.02	97.89	6057	15
260.211060	40.18	57.41	30.39	83.21	6050	15
260.281952	39.44	54.40	23.38	78.82	6065	12
260.352753	29.01	59.03	35.42	85.02	6056	12
260.423584	25.73	53.01	32.55	75.47	6048	18
260.494446	31.65	52.06	55.27	92.43	6054	18
260.565277	33.26	62.92	50.71	99.43	6051	15
260.636078	30.61	56.97	45.64	91.78	6055	22
260.706970	33.67	55.05	40.72	88.19	6053	22
260.777863	30.81	67.45	59.32	107.48	6040	32
260.848633	30.65	54.34	63.21	101.15	6044	32
260.919464	48.20	113.01	105.65	186.15	6054	94
260.977356	52.85	85.81	73.32	138.86	3827	94
261.012177	52.70	86.26	66.02	136.63	2080	39
261.059753	45.39	81.84	45.38	117.53	6032	39
261.130463	53.22	78.94	54.03	122.37	6046	27
261.201294	44.31	65.69	34.31	95.46	6042	27
261.272339	45.88	55.39	23.38	82.19	5893	9
261.343018	34.58	53.25	29.77	78.78	5914	9
261.413879	30.38	48.74	28.79	73.21	5917	15
261.484711	32.21	56.28	35.45	84.02	5914	15
261.555511	38.93	74.63	55.57	114.36	5914	27
261.626373	32.30	61.53	44.55	93.40	5904	39
261.697266	28.06	56.25	55.63	96.54	5901	39
261.768097	32.41	80.88	54.23	115.33	5901	56
261.839020	28.95	65.37	69.06	115.87	5871	56
261.909760	85.17	308.13	216.56	416.76	5897	236
261.972504	100.65	141.79	99.03	231.40	4547	236
262.007294	75.10	359.80	83.95	392.79	1219	179
262.050140	80.92	153.45	86.09	225.53	6012	179
262.120850	70.51	111.22	72.98	174.88	6044	179
262.191681	64.21	109.23	80.28	170.72	6038	67
262.262512	60.70	83.57	53.20	131.55	6053	48
262.333344	48.56	71.50	42.36	112.04	6048	48
262.492279	38.99	56.25	49.84	99.13	3099	80
262.546143	40.44	75.85	35.05	104.61	5940	80
262.617584	41.93	91.19	78.50	143.20	5759	80
262.687500	45.95	67.44	42.51	111.01	6051	80
262.758362	45.80	59.95	37.73	103.64	6049	15
262.829285	46.49	58.80	46.35	106.88	6037	15
262.900024	45.00	55.31	42.78	100.21	6055	15
262.967712	51.32	64.19	44.58	105.67	5514	15
263.002441	42.91	131.08	21.98	140.02	414	15
263.040283	51.97	67.36	46.00	110.11	6052	15
263.111115	53.82	85.54	50.74	122.85	6059	15

263.181976	47.55	74.69	41.80	108.03	6054	15
263.252777	49.80	47.97	26.56	81.70	6061	15
263.323547	40.71	46.34	20.21	72.03	6051	15
263.394562	31.50	71.50	47.05	102.55	6023	48
263.465302	38.74	100.46	86.20	154.47	6034	48
263.536133	46.71	105.90	82.57	157.78	6040	80
263.606934	40.85	78.29	54.33	120.54	6043	80
263.677795	41.18	65.15	33.83	100.83	6051	27
263.748627	40.52	52.85	43.81	97.49	6047	27
263.819458	42.64	53.58	31.55	89.73	6057	15
263.890320	45.41	52.26	49.00	98.64	6059	22
263.961121	49.63	64.00	53.78	111.09	6059	22
263.998260	21.88	113.76	20.10	119.41	295	22
264.032654	54.49	54.29	51.39	108.23	5576	22
264.100708	50.90	62.55	36.86	97.98	6058	22
264.171539	47.15	87.05	64.70	130.87	6055	22
264.242371	47.86	41.17	23.33	74.97	6061	22
264.313202	42.64	38.03	19.87	68.06	6055	4
264.384033	35.52	39.79	21.16	66.35	6059	12
264.454865	34.27	45.80	22.89	69.79	6057	12
264.525696	36.00	64.30	42.94	94.99	6047	18
264.596527	37.70	57.13	28.75	85.92	6054	18
264.667358	36.66	53.50	28.57	82.05	6054	7
264.736664	36.94	51.40	40.05	85.68	5749	7
264.808563	40.50	46.37	32.96	80.20	5784	6
264.879883	41.71	45.79	34.96	79.55	6055	6
264.950714	49.56	49.63	42.20	92.10	6060	6
264.993042	48.48	46.41	29.80	85.99	1187	6
265.027802	51.16	45.29	36.67	86.60	4742	7
265.090973	52.54	58.84	35.61	95.81	6055	7
265.161774	52.28	62.24	44.61	101.95	6039	12
265.232605	52.36	67.26	35.72	101.28	6049	12
265.303467	48.32	44.66	18.26	75.16	6061	7
265.374268	39.95	69.72	50.20	106.87	6047	7
265.445160	35.62	59.25	37.58	86.47	6044	15
265.515961	38.90	52.23	31.75	82.52	6056	12
265.586792	38.77	60.28	30.65	87.23	6055	12
265.657623	40.86	48.81	21.93	77.51	6055	6
265.728485	33.93	44.70	29.03	72.96	6054	6
265.799316	35.87	42.67	42.27	80.62	6054	7
265.870178	37.29	40.05	38.23	76.17	6054	7
265.940979	44.35	43.41	39.36	82.54	6056	6
265.988190	56.80	62.23	62.62	116.59	2018	6
266.022949	42.88	52.30	42.04	88.21	3911	12
266.076019	51.22	60.18	58.88	110.59	5149	12
266.152069	47.99	60.48	33.81	92.30	6056	9
266.222900	47.10	58.66	36.93	91.05	6057	9
266.293671	44.33	54.95	23.47	80.91	6050	6
266.364563	36.46	45.40	25.37	70.34	6050	6
266.512238	36.99	47.29	36.82	79.80	5028	6
266.577026	36.81	50.62	24.48	76.38	6049	6
266.647919	36.33	51.88	25.67	76.91	6058	5
266.718750	32.35	45.97	28.16	72.10	6047	5
266.789551	33.69	43.67	32.50	73.60	6047	6
266.860443	34.95	44.49	30.36	72.63	6052	6
266.931274	42.01	45.93	31.85	77.54	6056	3
266.983337	52.23	47.55	42.00	91.46	2841	3
267.018066	35.40	41.85	31.08	72.89	3085	7
267.071533	49.96	53.36	47.91	97.76	6050	7
267.142365	48.18	62.31	47.94	102.73	6064	15
267.213196	46.80	59.50	37.28	91.67	6061	15
267.283966	44.51	49.53	21.56	75.25	6046	6
267.354858	36.18	40.00	19.47	63.99	6062	6
267.425659	31.38	42.22	22.10	64.82	6055	4
267.496521	34.32	47.84	34.21	79.97	6056	4
267.567352	36.60	49.76	25.61	76.17	6053	6
267.638184	36.10	46.17	27.78	74.09	6054	6
267.709015	33.62	45.63	32.18	75.02	6051	6
267.779907	33.04	44.60	32.02	73.62	6043	5
267.850708	32.13	43.57	28.27	71.30	6056	5
267.921570	37.01	50.30	35.38	81.38	6060	4

267.978455	41.07	52.56	42.45	87.96	3673	4
268.012848	36.30	42.81	27.38	71.66	2201	2
268.061035	38.98	56.47	34.21	85.39	6042	2
268.131927	39.86	62.51	30.08	88.54	6064	5
268.202789	40.40	53.90	25.17	79.04	6060	5
268.273590	41.25	54.53	20.55	78.34	6065	3
268.344452	32.31	55.08	24.08	76.48	6060	3
268.415253	28.24	42.32	21.45	62.23	6059	4
268.486115	31.50	47.12	26.92	71.08	6058	4
268.556885	34.95	45.99	21.21	69.52	6043	5
268.627777	32.82	56.01	27.99	79.36	6044	15
268.698608	32.82	48.18	42.02	82.30	6041	15
268.769470	31.25	54.30	43.10	87.21	6052	48
268.840302	35.59	64.37	76.55	123.08	6055	48
268.911133	38.90	65.75	59.32	110.26	6057	18
268.973267	46.04	60.19	48.51	101.76	4560	18
269.007996	28.54	58.84	21.77	73.42	1365	12
269.051392	43.58	69.58	51.75	109.70	6052	12
269.122253	45.47	77.96	43.11	109.89	6042	12
269.193054	43.39	65.76	32.96	95.98	6044	12
269.270325	38.99	63.56	35.83	94.46	4874	15
269.325836	38.48	56.78	39.65	91.49	4535	15
269.405579	28.04	60.13	44.48	93.25	6055	18
269.476379	32.97	56.47	39.00	84.76	6056	18
269.547241	34.15	55.02	25.99	77.81	6038	18
269.618073	37.82	58.15	63.68	109.86	6050	18
269.688934	36.80	75.69	65.89	121.42	6040	27
269.759735	38.77	81.62	65.27	126.50	6048	22
269.830536	35.46	68.29	61.83	111.37	6038	22
269.901428	42.88	72.42	76.05	129.74	6056	27
269.968384	50.51	62.37	70.14	122.08	5383	27
270.003082	47.23	95.80	26.82	111.01	525	39
270.041656	52.48	87.67	76.87	144.00	6051	39
270.112488	55.58	75.33	64.52	130.02	6058	39
270.183197	49.80	69.55	40.53	105.09	5956	27
270.254211	47.09	77.01	48.51	116.69	6050	22
270.323700	42.38	61.62	29.79	89.64	5838	22
270.395844	33.89	69.87	57.27	109.14	6058	22
270.466644	36.13	64.50	52.38	102.53	6054	22
270.537476	36.61	55.66	46.38	92.41	6047	32
270.608307	38.81	71.33	76.66	129.59	6055	32
270.679169	38.71	53.78	48.64	97.23	6044	15
270.750061	33.27	52.48	44.79	89.91	6050	15
270.820831	36.83	59.81	61.29	106.87	6035	15
270.891693	39.13	54.76	46.55	94.86	6059	18
270.962524	44.78	54.40	51.18	98.29	6054	18
270.998932	20.40	115.73	11.80	118.42	177	18
271.033722	49.81	60.15	37.49	96.74	5736	12
271.102753	48.84	61.65	45.25	100.87	6058	12
271.173615	46.43	58.49	36.22	92.00	6056	12
271.244446	44.64	80.04	46.00	114.26	6049	12
271.315216	40.51	58.23	26.79	84.79	6055	18
271.386108	34.72	53.08	31.61	79.66	6060	12
271.456940	31.91	47.23	30.78	73.33	6061	12
271.527771	35.86	52.73	35.06	82.31	6053	9
271.598602	38.60	51.58	39.50	86.52	6051	9
271.669434	35.04	50.60	31.81	79.61	6048	9
271.740326	31.39	50.69	38.97	80.50	6050	9
271.811188	34.29	44.80	44.98	82.54	6042	7
271.881989	35.13	48.59	52.20	88.97	6045	12
271.952850	42.55	61.93	48.04	101.26	6041	12
271.994110	35.24	58.77	35.47	84.74	1002	12
272.028503	47.02	56.65	54.59	103.50	4863	9
272.092346	48.06	67.41	52.04	108.68	6053	9
272.163177	48.57	75.42	59.79	119.38	6047	22
272.234039	43.00	51.09	27.86	79.47	6044	22
272.304840	41.45	50.70	19.78	74.76	6052	6
272.375641	32.38	56.10	36.14	82.70	6049	18
272.446533	31.67	52.21	51.33	91.43	6058	18
272.517334	34.66	54.45	55.30	96.97	6052	18
272.588196	35.43	61.54	60.23	108.23	6056	18

272.659241	41.19	56.20	50.30	100.79	5479	12
272.729889	33.89	43.54	37.37	79.06	6052	12
272.800720	34.99	44.80	37.00	78.67	6053	4
272.871552	39.39	41.88	38.27	78.20	6054	4
272.942383	47.30	47.46	37.39	84.79	6056	3
272.988922	61.38	54.01	47.38	103.53	1887	3
273.023651	42.91	48.34	26.50	77.35	4033	7
273.082611	51.86	57.75	41.26	95.97	6051	7
273.153503	49.30	54.38	37.28	91.44	6049	9
273.224304	49.79	44.21	26.47	77.63	6058	9
273.294952	48.23	42.08	18.38	72.24	6001	3
273.366089	39.73	42.95	23.62	70.07	6039	3
273.436829	34.56	45.44	28.41	72.75	6060	9
273.507629	36.34	52.10	33.71	81.96	6054	7
273.578461	39.32	60.91	34.54	91.55	6053	7
273.649292	38.07	54.38	43.02	90.62	6055	6
273.720184	34.11	51.70	36.06	83.30	6044	6
273.791016	34.13	47.84	39.16	81.57	6036	6
273.861816	37.47	47.15	41.75	85.20	6043	6
273.932648	45.56	51.27	43.67	93.93	6059	6
273.984039	57.27	53.67	45.52	105.08	2726	6
274.018829	42.77	52.46	47.41	92.27	3195	18
274.072906	54.91	62.24	64.84	119.78	6044	18
274.143738	52.45	75.34	64.99	125.42	6059	27
274.214569	47.62	104.35	59.95	140.89	6048	27
274.285370	48.76	123.96	73.56	167.90	6056	56
274.356232	42.75	96.47	72.39	143.16	6055	56
274.427094	36.04	80.51	72.27	125.64	6052	48
274.497894	41.04	106.12	115.38	181.87	6037	48
274.568787	42.16	92.64	80.71	149.03	6031	67
274.639526	40.22	79.39	55.27	123.11	6044	48
274.710480	42.40	65.70	48.88	106.74	6032	48
274.781250	37.03	48.54	32.01	81.53	6048	48
274.852112	45.41	89.24	75.27	142.32	6055	48
274.922943	59.14	97.40	78.87	156.49	6050	94
274.979156	55.87	72.61	48.41	118.10	3549	94
275.013885	55.02	56.42	42.56	104.22	2377	27
275.063202	53.15	62.62	36.48	100.28	6045	27
275.134064	52.24	71.03	45.19	109.09	6038	22
275.204865	52.70	69.64	37.52	104.04	6056	22
275.275696	50.03	72.81	49.15	112.01	6060	18
275.346527	41.68	55.78	32.65	86.82	6057	18
275.417358	36.19	45.19	31.23	76.12	6059	7
275.488190	37.51	49.13	37.12	82.26	6050	7
275.558990	38.75	51.80	31.06	81.45	6041	6
275.629883	39.70	50.68	24.85	79.04	6037	12
275.700714	37.86	48.17	33.78	81.60	6051	12
275.771515	33.30	45.63	32.75	74.67	6043	6
275.842377	36.84	42.38	31.57	74.06	6055	6
275.913239	42.60	45.69	33.83	79.26	6052	4
275.974304	50.14	51.10	35.90	88.03	4387	4
276.008698	31.95	33.20	8.62	50.29	1486	2
276.052765	46.55	53.88	32.27	86.55	6047	2
276.123596	48.68	53.51	30.72	86.82	6061	2
276.194458	47.47	53.20	25.68	81.48	6044	4
276.265259	46.71	57.21	21.36	82.12	6059	5
276.336121	37.71	61.85	31.88	88.42	6053	5
276.406952	30.60	68.88	42.77	97.82	6058	6
276.477783	35.16	58.58	49.02	94.62	6059	6
276.548615	33.61	60.76	53.70	100.43	6050	9
276.619476	36.95	63.79	45.77	97.37	6038	9
276.690277	41.57	69.10	73.64	126.00	6053	32
276.761108	33.28	60.18	48.91	97.57	6046	9
276.831970	35.87	50.93	45.10	88.61	6053	9
276.902802	42.53	59.67	57.23	106.52	6059	12
276.969116	50.57	58.51	60.51	111.71	5273	12
277.003815	51.84	99.41	41.52	122.02	650	32
277.043030	51.75	68.93	52.96	116.88	6049	32
277.113892	56.23	78.86	79.94	143.34	6041	32
277.255737	49.67	93.27	84.95	155.29	6014	48
277.326355	43.72	108.42	72.72	156.58	6043	48

277.397156	40.78	115.32	104.72	180.35	6029	27
277.468018	42.76	88.14	88.43	151.38	6041	27
277.538910	46.09	104.36	84.02	158.89	6041	56
277.609711	41.07	74.03	68.71	128.96	6055	56
277.680603	43.71	62.97	69.49	120.71	6044	27
277.751434	38.61	59.80	57.96	105.78	6047	5
277.822266	42.19	52.94	53.04	99.82	6054	5
277.893066	44.92	50.21	55.77	100.99	6056	7
277.963928	48.72	49.45	50.42	97.59	6054	7
277.999664	37.07	114.50	11.12	121.12	58	7
278.034363	51.82	53.13	39.47	94.09	5871	7
278.104156	52.51	63.71	39.46	100.41	6048	7
278.174988	49.67	80.85	46.56	117.52	6054	18
278.245819	47.44	85.37	46.57	122.19	6049	18
278.316711	41.00	122.85	81.11	171.49	6043	48
278.387512	41.43	98.21	74.88	145.80	6040	48
278.458344	41.65	83.48	80.25	139.86	6051	48
278.529175	47.12	90.39	84.06	152.49	6047	94
278.599976	49.87	108.42	109.66	190.18	6047	94
278.670837	55.29	112.28	75.61	168.37	6050	67
278.741699	62.52	139.78	94.78	204.74	6046	67
278.812714	65.62	127.26	86.21	195.00	5992	154
278.883362	66.58	104.66	95.73	183.02	6055	67
278.954193	71.49	110.31	82.56	175.55	6052	67
278.994781	60.49	118.80	65.29	179.54	889	67
279.029449	76.38	93.96	57.45	152.99	5029	56
279.094452	79.04	111.44	84.70	180.02	6056	56
279.165283	75.05	114.22	110.84	200.25	6036	111
279.234467	89.75	144.60	146.62	246.96	5556	111
279.307007	72.49	168.70	124.64	242.78	6041	179
279.377808	61.32	102.20	63.23	150.58	6055	154
279.448608	51.79	85.53	49.60	127.39	6055	154
279.518311	76.18	152.66	138.68	246.59	5819	179
279.591553	71.38	150.04	100.16	217.40	5693	179
279.661102	83.54	143.23	103.01	216.15	6045	111
279.731934	72.37	128.82	72.14	183.35	6045	111
279.802826	69.21	113.33	50.14	164.01	6040	94
279.873840	68.91	101.21	63.48	159.19	5992	94
279.944458	70.18	88.73	61.77	146.87	6059	48
279.989929	95.81	73.73	50.71	152.92	1716	48
280.024323	58.10	78.74	51.58	123.05	4151	12
280.084015	69.02	75.37	39.65	124.02	6057	12
280.154846	65.98	69.15	30.65	111.10	6064	3
280.225647	64.88	56.22	26.39	101.32	6053	3
280.295166	63.52	51.11	22.93	93.61	5832	3
280.367493	52.41	49.09	24.37	86.82	6038	3
280.438232	44.90	51.07	24.14	84.20	6053	2
280.509216	44.47	55.85	30.33	88.16	5998	4
280.579865	46.34	58.56	25.37	90.42	6052	4
280.650665	47.88	55.54	21.75	88.24	6057	2
280.721527	44.54	55.62	24.16	87.56	6049	2
280.792358	44.61	51.05	27.09	84.57	6049	4
280.863220	47.64	51.26	27.10	85.24	6053	4
280.934052	53.20	49.43	30.27	87.36	6060	3
280.984711	65.00	51.53	37.25	102.47	2608	3
281.019196	44.03	48.47	25.87	77.64	3257	0
281.074219	56.77	60.61	35.49	99.63	6041	0
281.145142	56.21	66.75	33.99	101.28	6059	4
281.215973	54.34	63.05	35.43	98.08	6056	4
281.286804	52.58	72.44	25.03	101.33	6065	5
281.357635	42.65	55.12	28.17	84.52	6058	5
281.428467	36.48	51.05	26.63	76.02	6060	4
281.499298	38.07	56.26	38.82	87.99	6053	4
281.570068	40.90	63.25	44.83	100.65	6039	9
281.640961	40.28	56.63	32.34	89.04	6058	6
281.711823	40.22	52.68	32.56	85.12	6056	6
281.782654	38.14	47.46	34.25	82.00	6051	6
281.853180	40.08	46.00	32.04	78.46	5989	6
281.924316	46.11	45.05	34.20	81.20	6060	0
281.979828	53.01	49.17	41.91	93.27	3429	0
282.014618	42.11	48.12	18.92	72.07	2491	0

282.064545	49.63	53.92	33.50	88.76	6046	0
282.135376	52.33	59.48	33.30	93.87	6058	2
282.206024	49.34	53.18	29.00	84.70	5992	2
282.277069	50.20	40.86	18.56	72.06	6058	2
282.347900	39.93	39.50	20.34	67.08	6062	2
282.418732	34.93	40.75	21.35	65.80	6056	2
282.489594	35.01	48.19	23.80	73.63	6047	2
282.560394	37.30	52.32	22.11	76.62	6051	2
282.631256	38.79	50.89	28.94	80.16	6052	2
282.702332	36.99	45.99	24.71	73.47	5998	2
282.772858	33.60	41.88	30.71	71.98	6038	3
282.843781	35.50	43.11	31.45	73.99	6047	3
282.914825	42.16	45.05	43.26	84.90	6014	7
282.975220	51.37	58.30	49.53	102.40	4209	7
283.009705	33.85	39.30	22.51	65.95	1664	3
283.055176	47.30	54.73	32.15	87.97	5991	3
283.125763	47.34	56.47	26.35	85.73	6046	2
283.196533	46.61	47.99	25.14	77.79	6061	2
283.267365	46.77	43.29	20.67	71.69	6061	2
283.338196	37.45	42.84	21.89	68.41	6060	2
283.408997	32.89	42.00	21.99	65.49	6049	2
283.479858	32.62	46.58	26.53	72.23	6055	2
283.550690	35.45	49.68	25.37	75.75	6050	4
283.621490	36.97	53.15	34.83	84.14	6055	4
283.692352	35.53	46.68	36.50	80.57	6045	4
283.763214	32.86	47.89	44.82	85.03	6050	6
283.834015	33.79	46.72	37.69	81.73	6046	6
283.904877	36.19	49.94	39.84	83.51	6055	7
283.970245	42.18	53.14	49.68	95.42	5089	7
284.004517	40.66	53.20	15.11	71.70	773	7
284.044464	42.72	59.56	48.04	99.50	6054	7
284.115265	45.00	62.59	43.50	99.98	6051	7
284.186096	41.64	69.25	38.53	97.50	6042	9
284.256897	44.05	59.26	41.79	94.41	6049	15
284.327759	34.30	76.22	36.25	101.25	6046	15
284.398621	31.19	77.73	53.66	112.93	6053	9
284.469421	33.28	65.23	55.06	101.85	6051	9
284.540253	33.21	57.93	42.13	88.61	6053	6
284.611115	34.97	59.41	45.54	94.15	6054	6
284.681976	34.92	59.20	41.29	91.57	6057	7
284.752838	34.92	46.72	30.48	77.24	6042	4
284.823944	33.88	44.61	31.79	73.14	5992	4
284.894501	35.32	49.99	40.80	82.07	6059	7
284.965057	42.65	51.08	36.64	85.17	5971	7
285.035309	42.03	63.64	50.90	102.32	5944	27
285.105530	48.97	78.32	74.31	132.70	6051	27
285.176361	46.57	77.29	77.64	133.24	6041	39
285.247223	40.65	104.66	67.85	145.00	6056	39
285.317993	34.01	75.89	41.63	103.28	6053	9
285.388947	31.66	53.25	37.53	81.81	6055	6
285.459717	30.55	55.50	35.25	80.26	6060	6
285.530548	35.78	54.61	52.20	95.62	6051	12
285.601379	34.93	57.11	33.66	86.04	6054	12
285.672241	34.35	48.48	27.66	76.35	6051	5
285.743073	37.57	48.40	36.66	82.22	6050	5
285.813904	36.49	58.10	50.81	97.35	6052	18
285.884735	35.25	52.04	49.30	89.89	6057	4
285.955048	42.15	51.86	40.73	88.36	5958	4
285.995941	27.26	47.14	27.21	66.88	652	4
286.030243	48.21	57.68	40.56	95.55	5163	9
286.095825	49.12	57.40	38.26	93.96	6056	9
286.166626	45.72	61.13	30.88	90.49	6043	4
286.237671	46.92	49.43	25.24	78.92	5965	4
286.308350	42.90	50.43	22.37	76.37	6059	4
286.379181	35.27	46.19	25.64	72.01	6057	5
286.449982	33.10	47.10	33.93	75.72	6059	5
286.520752	35.94	49.51	28.62	75.61	6037	6
286.591644	37.66	53.39	35.43	84.47	6050	6
286.662476	34.61	48.40	34.20	77.65	6052	4
286.733337	30.01	45.11	32.20	73.42	6050	4
286.804199	30.97	42.15	37.28	74.41	6048	4

286.875031	33.00	41.65	39.02	74.59	6057	15
286.945831	41.61	50.69	43.78	90.76	6057	15
286.990601	54.09	62.28	63.07	114.53	1600	15
287.024933	39.55	68.95	69.52	123.02	4236	80
287.085388	60.49	99.63	118.78	187.54	6040	80
287.156250	52.54	98.83	103.89	172.95	6020	111
287.297913	46.15	48.23	44.79	91.68	6063	15
287.368713	36.54	52.09	49.01	90.32	6048	15
287.439606	33.46	50.96	52.09	91.43	6057	9
287.510406	34.75	53.39	48.93	91.22	6049	27
287.581268	35.05	65.25	47.25	98.75	6043	27
287.652100	34.18	53.58	54.82	98.10	6035	27
287.722931	35.31	62.20	56.31	105.48	6050	27
287.793762	35.51	56.53	58.57	102.51	6048	15
287.864594	34.59	57.33	61.15	105.75	6052	15
287.935425	43.51	65.53	67.48	118.94	6046	6
287.985443	56.46	70.11	69.31	127.85	2487	6
288.020172	41.26	57.40	60.25	109.36	3435	22
288.075623	54.66	84.50	77.41	142.72	6041	22
288.146515	47.01	89.07	81.30	147.76	6052	39
288.288300	51.49	114.29	86.20	174.58	6022	67
288.359009	39.00	111.42	82.63	163.73	6055	67
288.429871	42.21	107.10	77.12	159.76	6060	48
288.500671	41.40	80.17	76.46	134.42	6038	48
288.571503	46.89	111.90	79.85	164.98	6044	48
288.642365	48.50	96.17	83.64	157.97	6046	56
288.713226	53.45	99.35	92.41	163.25	6049	56
288.784027	48.66	79.03	82.96	141.01	6030	32
288.854889	43.21	53.04	58.25	106.75	6054	32
288.925751	47.85	68.36	60.92	120.56	6050	48
288.980530	56.42	69.98	57.14	126.43	3317	48
289.015289	41.09	61.25	32.31	89.69	2610	7
289.065948	51.47	68.19	45.84	108.44	6051	7
289.136780	50.56	73.35	50.43	113.54	6052	15
289.207611	47.36	72.08	34.15	101.30	6053	15
289.278473	46.02	48.43	21.04	75.98	6060	6
289.349304	37.04	42.51	20.43	68.82	6055	6
289.420135	32.49	42.27	20.71	65.48	6059	6
289.490967	35.62	47.31	24.54	71.37	6054	6
289.561768	38.57	51.62	30.97	81.92	6045	7
289.632629	37.59	54.59	26.20	80.51	6054	6
289.703491	36.68	51.67	36.59	85.62	6054	6
289.774323	37.89	55.11	33.67	85.92	6048	7
289.845154	35.41	47.13	42.17	85.15	6046	7
289.916016	39.02	50.81	50.42	94.54	6057	7
289.975708	47.63	54.29	47.44	98.93	4142	7
290.010406	30.34	51.68	29.32	74.21	1771	32
290.056274	52.16	84.58	70.21	136.43	6047	32
290.126801	50.06	76.63	41.99	111.56	5465	7
290.197968	45.29	58.99	28.46	85.99	6021	7
290.268707	45.41	46.27	21.63	74.53	6053	5
290.339569	36.29	47.06	20.19	70.73	6058	5
290.410400	30.43	44.27	25.62	68.29	6054	5
290.481262	32.58	43.23	23.28	67.65	6053	5
290.552094	36.72	48.82	27.91	76.25	6054	6
290.622925	37.54	50.54	26.13	77.66	6052	6
290.693787	35.41	53.60	47.42	91.48	6055	12
290.764587	35.24	49.87	44.82	86.72	6049	7
290.835419	35.13	41.18	35.82	75.14	6053	7
290.909241	39.79	52.62	44.04	91.57	5529	7
290.970825	43.89	44.78	36.79	82.52	4979	7
291.005219	38.78	47.52	11.03	65.18	892	15
291.045837	45.16	58.34	41.32	93.81	6051	15
291.116669	51.18	72.35	64.43	121.97	6055	15
291.187500	43.76	59.47	30.98	87.24	6061	15
291.258331	44.05	50.19	23.15	76.31	6061	7
291.329163	36.79	46.55	22.44	69.69	6052	7
291.399963	31.72	47.69	33.35	75.72	6050	7
291.470856	29.16	44.45	27.93	68.69	6054	7
291.541656	34.06	54.02	26.08	78.03	6053	7
291.610535	37.05	63.20	30.71	88.08	5427	7

291.683350	41.95	54.46	25.43	82.95	6053	7
291.754181	31.93	45.38	32.96	72.95	6050	15
291.825012	34.02	44.94	58.09	93.19	6050	15
291.895844	42.46	41.67	49.39	89.84	6054	12
291.965637	47.10	49.54	43.44	91.88	5875	12
292.000336	47.53	95.12	17.88	107.96	57	15
292.036102	53.02	56.25	38.99	98.59	6052	15
292.106934	55.19	58.72	40.48	100.83	6057	15
292.177765	50.65	62.95	46.04	103.24	6055	9
292.248596	50.07	61.38	30.94	93.37	6059	9
292.319458	45.35	47.76	23.05	77.42	6055	6
292.390289	38.61	48.38	27.75	75.52	6063	7
292.461121	37.64	56.17	39.14	89.28	6054	7
292.531921	40.05	56.15	41.07	91.75	6050	12
292.602753	37.22	57.23	43.56	92.16	6049	12
292.673615	39.66	49.58	33.55	81.62	6051	6
292.744446	30.97	43.66	37.82	75.70	6051	6
292.815277	32.93	49.24	39.45	81.68	6050	6
292.886108	39.64	55.24	48.94	94.08	6052	12
292.956970	48.47	54.45	42.89	95.29	6055	12
292.996185	25.55	52.61	23.12	71.66	654	12
293.030884	52.71	52.67	34.98	93.14	5273	12
293.097198	56.78	64.42	47.07	109.57	6055	12
293.168030	47.29	61.30	33.13	92.43	6051	12
293.238892	48.53	57.04	28.87	87.72	6060	12
293.309723	43.79	65.22	28.10	93.65	6052	9
293.380554	37.76	51.47	29.26	80.14	6058	7
293.451385	31.63	51.93	26.91	76.44	6057	7
293.522186	34.13	54.77	32.43	81.89	6052	15
293.593079	37.03	57.26	31.22	85.91	6011	15
293.663879	37.99	55.65	31.36	85.59	6051	5
293.734711	30.52	45.95	31.46	73.32	6046	5
293.805573	30.75	50.26	33.81	77.51	6051	5
293.876404	31.55	42.45	40.64	75.30	6058	7
293.947235	38.41	46.32	34.47	78.67	6055	7
293.991302	55.08	46.33	45.88	95.34	1482	7
294.026093	35.62	51.35	26.67	76.69	4438	3
294.087494	41.35	57.08	41.34	92.35	6055	3
294.158325	40.44	54.94	38.90	88.12	6049	4
294.299988	36.72	45.81	41.50	80.01	6052	2
294.370819	29.34	41.27	43.55	76.22	6059	2
294.441681	26.57	44.33	45.67	78.43	6058	3
294.512512	29.70	48.27	44.43	82.43	6053	2
294.583282	34.71	53.46	45.12	89.15	6052	2
294.654144	33.29	50.26	45.63	87.72	6053	3
294.725037	31.85	44.88	48.73	86.25	6054	3
294.795868	32.86	48.69	47.56	88.70	6053	4
294.866638	32.30	50.18	43.25	85.54	6038	4
294.937439	35.38	47.54	46.73	88.28	6045	2
294.986450	49.94	59.32	63.05	113.58	2312	2
295.020844	28.52	47.69	33.76	76.28	3557	2
295.077057	40.63	55.82	44.21	93.31	6057	2
295.147949	36.79	63.29	40.04	93.67	6046	0
295.289581	35.25	40.86	37.82	74.10	6062	2
295.360413	28.67	41.36	39.95	73.31	6060	2
295.431274	25.46	43.78	43.95	75.89	6056	3
295.502075	29.35	49.75	44.01	82.26	6057	6
295.572906	33.12	57.01	43.18	91.50	6053	6
295.643738	33.95	49.65	43.37	86.79	6051	5
295.714569	32.65	46.07	44.41	85.22	6044	5
295.785431	34.26	43.55	47.54	86.59	6051	4
295.856262	31.10	46.73	46.50	83.30	6041	4
295.927124	33.20	47.39	47.87	86.46	6048	2
295.981232	40.86	50.39	47.20	92.40	3201	2
296.016022	29.16	48.78	25.33	72.40	2727	3
296.067352	36.77	55.15	33.52	83.63	6045	3
296.138184	34.26	61.46	32.68	85.70	6059	3
296.209076	37.09	54.45	25.51	77.20	6048	3
296.279846	33.10	47.76	20.16	66.92	6061	7
296.350708	25.79	50.56	26.81	69.46	6055	7
296.421539	26.85	50.16	26.87	69.77	6052	15

296.492371	31.90	62.05	48.34	96.87	6053	15
296.563171	33.89	58.92	57.36	101.91	6041	18
296.634033	34.22	60.02	56.50	101.09	6055	39
296.704865	36.47	54.47	55.01	98.52	6030	39
296.775757	44.60	78.18	87.61	143.98	6028	32
296.846527	36.57	79.28	58.66	121.73	6035	32
296.916687	40.60	57.67	53.43	101.70	5874	12
296.976349	51.01	63.00	75.80	127.24	4022	12
297.011078	39.22	61.28	54.14	106.65	1898	27
297.057617	49.79	67.99	47.51	108.67	6053	27
297.128448	43.77	67.18	39.16	99.02	6049	18
297.199310	46.03	60.49	36.74	92.72	6030	18
297.270111	45.85	72.52	57.56	117.67	6055	22
297.340942	39.24	57.87	40.63	92.09	6058	22
297.412048	33.60	49.93	39.62	84.17	5983	22
297.482635	33.48	53.61	61.34	99.66	6052	22
297.553467	35.71	51.31	36.31	82.60	6051	9
297.624298	37.12	50.67	27.90	78.13	6055	9
297.695221	35.76	53.57	25.18	77.68	6043	6
297.765991	34.21	50.78	30.27	77.05	6049	7
297.836792	33.39	42.93	33.08	73.36	6049	7
297.907654	39.61	47.03	44.20	85.71	6059	9
297.971466	50.65	54.53	52.89	104.47	4851	9
298.005920	42.09	46.86	9.89	66.23	1008	9
298.047211	49.36	67.33	39.01	102.04	6043	9
298.118042	51.39	59.65	45.32	101.88	6045	9
298.188904	46.89	51.80	29.88	83.48	6048	6
298.259735	47.31	51.20	21.22	77.86	6063	9
298.330536	37.80	72.52	36.53	102.27	6056	9
298.401367	31.72	67.22	63.81	110.55	6050	18
298.472198	36.22	61.33	72.84	112.97	6047	18
298.543030	37.74	58.57	47.97	96.82	6051	12
298.613892	36.77	53.99	29.79	82.47	6055	12
298.684723	38.91	50.50	27.43	79.22	6050	5
298.755585	33.53	50.60	37.81	80.78	6047	6
298.826416	32.43	45.46	35.13	75.95	6053	6
298.897247	38.24	45.09	41.51	82.18	6061	6
298.966339	46.44	48.47	43.75	90.97	5757	6
299.001068	43.45	92.81	23.08	105.37	176	2
299.037445	49.39	55.43	45.55	99.55	6044	2
299.108307	47.38	63.97	48.51	104.76	6051	2
299.179169	44.41	53.75	39.56	89.46	6050	3
299.249969	45.95	46.10	41.12	85.42	6057	3
299.320801	38.71	59.00	42.59	92.59	6057	7
299.391663	32.90	57.40	55.82	97.53	6053	7
299.462524	30.52	60.08	56.79	99.01	6053	7
299.533325	39.44	61.48	70.65	113.66	6048	12
299.604156	38.84	63.69	51.28	103.67	6052	12
299.674988	38.93	55.24	40.24	91.46	6050	4
299.821777	34.01	49.11	50.18	92.96	5181	6
299.887604	34.75	45.72	54.44	93.38	6045	7
299.958313	43.93	52.33	56.14	102.33	6040	7
299.996857	23.04	63.13	74.32	111.13	532	7
300.031586	51.24	56.89	52.73	104.07	5390	12
300.098663	51.39	64.10	49.32	105.99	5970	12
300.169464	43.68	83.66	46.80	116.82	6054	9
300.240265	42.47	84.97	37.69	114.56	6052	9
300.311127	39.84	84.30	33.38	111.99	6064	7
300.381958	34.09	63.94	36.06	90.53	6058	7
300.452789	30.98	58.01	38.75	85.49	6058	7
300.523621	34.86	60.55	50.57	97.81	6051	7
300.594421	37.14	56.91	34.72	86.82	6055	7
300.665283	34.76	50.09	34.51	81.34	6050	4
300.736145	29.59	49.68	32.90	76.31	6052	4
300.806976	31.30	47.51	33.34	74.20	6051	6
300.877808	32.48	49.04	44.40	83.21	6057	9
300.948639	43.23	51.15	52.34	98.63	6059	9
300.992004	52.67	52.78	41.72	96.19	1362	9
301.026794	42.15	53.12	48.12	95.40	4566	9
301.088898	47.80	59.57	38.09	95.80	6054	9
301.159729	50.27	56.32	26.51	92.69	6062	2

301.230530	52.99	107.62	55.59	155.37	6055	2
301.301392	117.05	245.05	49.39	299.32	6062	5
301.372223	65.24	74.90	40.28	126.19	6056	5
301.443054	30.32	53.33	50.02	91.98	6055	5
301.513885	33.99	51.09	42.38	83.76	6052	4
301.584747	37.59	57.63	22.16	82.06	6053	4
301.655579	37.41	56.82	24.68	82.24	6055	4
301.726410	33.62	53.65	25.46	76.70	6054	4
301.796234	32.55	53.19	17.30	72.44	5407	3
301.868805	36.30	51.37	17.82	74.44	5906	3
301.938904	42.73	50.96	20.14	79.07	6059	4
301.987152	50.17	73.30	38.83	112.25	2190	4
302.021545	44.41	44.29	32.19	80.08	3677	3
302.078339	48.29	60.68	30.77	95.84	6006	3
302.149292	42.39	59.83	30.01	90.75	6063	3
302.220184	44.14	62.47	29.24	93.47	6036	3
302.290985	41.15	66.07	27.05	93.05	6062	9
302.361816	33.96	60.69	24.39	81.64	6057	9
302.432617	33.43	79.68	58.45	121.16	6027	39
302.503510	33.54	57.21	53.17	96.47	6040	27
302.574249	35.21	70.00	58.07	111.29	6046	27
302.645111	35.80	59.39	45.65	96.40	6041	9
302.716003	34.68	59.05	27.76	83.78	6049	9
302.786804	30.90	56.69	32.58	81.53	6047	15
302.857635	29.78	57.00	37.45	87.22	6044	15
302.928497	40.45	71.19	41.47	109.93	6058	56
302.981934	57.71	81.83	39.22	122.25	3073	56
303.016693	44.90	118.57	91.88	174.74	2831	80
303.068787	63.14	117.00	89.01	180.02	6035	80
303.139557	61.73	106.28	90.22	168.90	6038	80
303.210419	53.85	130.24	81.63	177.84	6059	80
303.281250	53.58	113.75	68.41	157.88	6052	22
303.352081	40.79	110.70	68.22	153.68	6052	22
303.422913	37.50	104.30	72.89	152.90	6055	27
303.493744	40.24	75.19	56.43	117.18	6045	27
303.564575	45.47	72.13	60.31	122.19	6050	15
303.635406	45.47	72.65	72.77	133.22	6051	18
303.706268	49.62	87.03	63.79	136.00	6055	18
303.777100	44.07	83.37	61.02	126.65	6047	18
303.847931	42.39	72.70	61.53	119.28	6053	18
303.918793	46.08	68.25	41.45	106.72	6053	12
303.977051	53.21	66.58	33.49	106.01	3908	12
304.011810	42.45	65.10	70.67	123.11	2020	48
304.058990	52.30	81.37	50.16	122.63	6050	48
304.129852	53.29	88.67	57.65	133.13	6056	22
304.200684	50.47	60.28	34.21	95.02	6060	22
304.271515	48.12	58.34	27.70	90.40	6060	12
304.342377	37.48	62.70	28.65	89.38	6055	12
304.413177	34.83	86.40	50.36	120.41	6054	18
304.484009	34.11	59.92	37.58	87.07	6055	18
304.554840	36.23	61.56	36.22	88.93	6054	6
304.625702	37.30	73.90	42.92	105.99	6041	7
304.696564	33.91	53.47	36.06	86.39	6051	7
304.767365	33.43	55.86	46.70	93.12	6051	6
304.838226	33.17	53.64	49.17	92.86	6055	6
304.909119	40.13	48.71	53.14	94.80	6045	4
304.972229	45.80	49.06	54.59	99.67	4743	4

APPENDIX E. LATE CALIBRATION ORBITAL RESULTS FOR NON-AURORAL DATA

The columns of data below have the following format from left to right, where an orbit is defined only as a 6120second period:

1. Average decimal day of year 2000 of the field vector in this orbit.
2. Orbital average difference from zero of measured-minus-modeled field for non-auroral (automated clipping) X (down) components in nT.
3. Orbital average difference from zero of measured-minus-modeled field for non-auroral (automated clipping) Y (velocity) components in nT.
4. Orbital average difference from zero of measured-minus-modeled field for non-auroral (automated clipping) Z (orbit normal) components in nT.
5. Orbital average magnitude of differences from zero of measured-minus-modeled field for non-auroral (automated clipping) components in nT.
6. Number of vectors contributing to these averages.
7. Three hour Ap most closely corresponding to the value in column 1.

5.027755	33.63	70.98	167.65	196.34	3416	27
5.090914	32.72	61.49	192.01	214.74	4006	27
5.161644	27.85	68.56	193.97	215.23	4083	18
5.231574	26.59	60.37	185.80	203.96	4256	18
5.371875	19.12	58.44	192.73	208.27	4425	18
5.522280	15.53	61.94	166.72	185.99	3373	9
5.585544	20.19	53.13	187.50	208.56	4316	9
5.733137	22.82	44.97	168.25	186.89	3318	15
5.796366	24.62	45.60	176.32	194.08	4280	22
5.868137	23.48	47.02	178.71	198.77	4451	22
5.987731	35.82	68.63	222.54	247.92	1284	27
6.021586	33.40	43.27	25.41	69.05	2946	12
6.081134	30.33	47.31	20.14	65.36	4024	12
6.151979	26.75	45.76	21.15	62.91	4072	18
6.221979	25.59	41.12	17.76	56.52	4221	18
6.291921	21.88	38.62	13.24	50.67	4378	7
6.362211	16.09	35.95	16.83	48.50	4430	7
6.432755	15.53	31.11	14.23	43.70	4341	18
6.503449	16.03	38.84	23.21	55.73	4239	32
6.575764	21.78	63.37	49.35	92.02	4341	32
6.646678	18.19	71.68	46.28	95.58	4140	32
6.716123	19.79	44.16	32.59	69.17	4096	32
6.786632	25.98	43.74	21.84	64.15	4267	15
6.858113	22.56	46.83	23.61	65.30	4415	15
6.929884	27.27	46.92	31.65	72.78	4615	18
6.983414	30.91	50.80	27.50	71.87	2269	18
7.018299	25.05	42.25	21.28	61.89	2143	18
7.070984	25.31	48.13	26.12	66.21	4076	18
7.142245	22.56	46.77	18.78	60.04	4055	15
7.212361	21.00	39.63	14.52	52.27	4201	15
7.282292	20.40	37.09	15.22	50.56	4351	5
7.352558	14.98	36.32	20.60	50.59	4430	5
7.423032	13.81	35.28	17.95	47.76	4374	7
7.493669	17.11	37.42	18.97	50.76	4259	7
7.565949	22.42	46.11	15.72	59.53	4359	7
7.637303	22.78	48.42	19.77	62.43	4058	9
7.706539	24.09	43.73	23.95	61.58	4043	9
7.776817	25.72	43.81	23.97	63.02	4250	12
7.848148	22.33	46.49	22.16	63.37	4340	12
7.919977	26.58	43.41	28.70	66.24	4602	7
7.978125	24.31	49.65	23.73	66.34	2927	7

8.014664	37.87	33.63	100.20	123.70	1506	7
8.060683	25.84	52.68	167.57	185.55	4176	7
8.132593	24.11	48.97	176.43	191.32	4029	3
8.202755	22.42	46.13	176.29	189.23	4185	3
8.272639	21.95	42.15	175.00	186.42	4333	5
8.413299	14.38	41.95	172.37	181.74	4400	6
8.483993	16.58	43.86	165.67	178.35	4268	6
8.556134	23.04	53.25	167.27	187.39	4381	6
8.627315	23.70	51.13	171.38	190.58	4208	9
8.774664	21.29	40.82	154.23	172.38	3380	3
8.838194	22.02	39.04	164.49	179.77	4299	3
8.974074	32.21	50.02	172.03	192.91	2809	0
9.007431	41.88	33.25	49.06	78.30	1226	5
9.050741	30.52	48.73	57.55	89.24	4196	5
9.122894	35.07	47.25	59.89	93.01	4036	5
9.193194	28.57	43.42	61.83	87.75	4146	5
9.263044	26.94	40.17	66.02	87.79	4314	0
9.333252	18.64	35.14	65.21	81.69	4380	0
9.626736	21.12	43.59	58.28	82.69	3249	2
9.687512	15.89	40.98	67.32	87.29	3918	2
9.834745	22.25	40.12	55.25	79.76	3549	2
9.900174	28.90	40.76	64.23	89.63	4510	6
9.967708	31.11	42.73	63.99	90.78	4059	6
10.002442	43.04	34.14	55.42	83.43	414	5
10.040741	35.20	51.60	155.89	176.19	4247	5
10.118715	38.81	59.19	152.28	177.11	3437	5
10.183507	29.62	53.17	166.00	183.96	4146	7
10.253437	27.30	50.45	166.94	182.30	4300	3
10.323438	20.81	46.54	161.53	174.74	4371	3
10.393889	19.82	44.64	162.94	174.28	4407	3
10.464525	18.91	46.11	157.93	170.76	4304	3
10.536447	20.94	50.91	162.07	178.61	4378	4
10.607824	21.89	49.15	167.26	182.47	4255	4
10.678183	17.63	40.50	171.71	182.12	3998	6
10.966215	33.79	54.82	147.90	176.02	4073	15
10.997824	21.56	51.96	138.65	151.39	223	15
11.136644	28.30	62.89	9.52	69.64	27	9
11.173958	32.42	45.66	20.08	66.04	4106	9
11.243762	29.36	41.95	10.99	56.78	4268	9
11.313704	24.21	39.78	15.99	54.13	4365	6
11.384225	21.10	34.97	10.73	46.84	4419	9
11.454792	20.97	35.26	12.70	49.31	4332	9
11.526597	20.81	45.24	21.43	62.32	4381	22
11.598044	19.66	63.93	27.95	81.76	4290	22
11.668623	18.48	48.81	19.38	61.62	4060	22
11.738113	22.64	45.94	32.19	73.45	4159	22
11.808843	31.20	71.30	58.52	114.33	4288	56
11.880625	30.76	81.82	56.50	123.17	4492	56
11.952269	37.60	85.59	57.62	123.38	4611	56
11.990984	36.62	79.89	26.53	104.40	709	56
12.029028	39.46	72.55	36.58	100.83	3572	22
12.093634	42.66	63.61	50.76	101.49	4004	22
12.164306	36.54	59.96	46.46	92.72	4087	15
12.234213	37.27	58.18	52.73	95.82	4256	15
12.304213	30.14	48.56	50.09	84.69	4402	12
12.374572	26.44	51.05	51.47	85.28	4426	12
12.445139	21.70	50.22	46.76	80.31	4312	7
12.516574	21.83	51.69	52.56	85.38	4348	4
12.660475	22.05	45.45	49.53	81.03	3524	7
12.728414	21.49	45.07	47.96	81.86	4140	7
12.799097	25.95	43.15	45.93	80.42	4274	9
12.871157	29.55	45.91	51.46	87.10	4404	9
12.942442	36.83	54.11	50.89	93.94	4626	7
12.986690	40.64	53.74	65.05	106.81	1190	7
13.022639	41.09	56.24	23.45	81.97	3171	7
13.083819	44.90	48.83	21.99	76.49	4015	7
13.154641	39.57	50.13	20.00	72.63	4082	9
13.224630	36.10	45.87	13.34	65.44	4225	9
13.294595	30.30	42.71	13.86	60.20	4385	9
13.364907	24.27	41.03	19.24	57.54	4432	9
13.435440	24.90	37.25	15.92	54.17	4332	15

13.505949	19.81	43.91	23.19	59.91	4188	9
13.578715	19.06	53.00	20.56	66.33	4281	9
13.649306	16.30	51.00	20.59	62.24	4095	12
13.719109	18.42	43.10	25.46	58.91	4047	12
13.789317	24.76	43.01	21.18	60.63	4269	4
13.860810	22.98	42.86	19.02	60.33	4428	4
13.922095	27.79	55.50	29.11	77.82	3337	6
13.987211	31.87	49.67	14.94	67.10	1708	6
14.019086	23.77	63.59	46.45	91.98	2375	15
14.073947	26.15	47.25	62.00	90.29	4036	15
14.144942	23.52	47.19	63.40	89.73	4062	9
14.215035	23.51	39.68	65.23	86.56	4201	9
14.284954	21.41	38.14	66.08	85.41	4360	4
14.355243	15.51	34.87	66.27	81.57	4432	4
14.425694	13.46	35.68	65.40	80.69	4368	3
14.496354	15.84	38.55	67.66	84.93	4251	3
14.568646	21.43	50.63	64.83	94.40	4354	6
14.856586	21.05	41.30	61.68	88.18	3673	9
14.891273	27.68	43.16	93.79	114.20	758	6
15.035949	17.06	61.72	67.38	94.63	155	7
15.135220	24.08	47.21	76.95	100.58	4034	7
15.205417	23.45	41.47	79.12	98.62	4190	7
15.275336	22.66	38.38	79.97	97.34	4340	5
15.345567	16.23	34.96	77.04	91.36	4411	5
15.415995	14.81	34.63	78.12	91.21	4393	3
15.486655	16.97	39.35	75.50	92.89	4264	3
15.558866	21.68	45.25	74.84	97.67	4374	7
15.629977	19.85	48.10	80.64	102.88	4207	5
15.670289	23.74	49.90	117.65	133.71	968	5
16.010197	31.05	36.14	130.20	146.54	1226	5
16.053461	29.85	55.12	178.27	198.11	4199	5
16.125557	29.12	52.19	190.30	207.25	4028	4
16.265730	24.28	50.24	187.48	200.97	4322	5
16.335810	16.99	45.08	180.32	191.28	4390	5
16.406307	16.29	47.89	181.98	192.92	4396	5
16.629108	19.89	48.08	172.21	187.55	3277	6
16.767244	21.80	40.10	174.38	189.52	3406	6
16.831076	21.38	37.67	179.88	194.58	4277	6
16.902893	24.24	46.49	173.32	192.65	4518	7
16.968472	28.22	57.81	185.77	209.35	3805	7
17.003832	40.53	30.10	57.03	83.76	651	5
17.115845	33.86	49.61	103.17	128.13	4023	5
17.186146	28.48	45.44	106.08	126.27	4153	2
17.256111	27.46	45.06	105.31	123.92	4305	4
17.396631	18.24	39.53	103.34	116.81	4404	2
17.467245	17.70	40.06	100.50	115.26	4297	2
17.539202	20.66	44.89	105.81	123.69	4388	3
17.610485	20.98	46.01	105.69	124.49	4245	3
17.680695	16.12	41.99	104.44	120.61	3968	2
17.750441	20.31	39.67	102.89	120.65	4206	3
17.821365	21.26	38.82	92.02	110.83	4279	3
17.893171	23.08	41.03	96.88	115.76	4513	0
17.964733	29.82	45.14	87.24	111.77	4591	0
17.999641	21.32	50.61	29.58	63.05	59	0
18.005360	16.33	54.37	67.95	90.20	169	2
18.106089	40.92	51.04	95.96	125.87	4019	2
18.176598	33.62	56.19	124.31	148.34	4115	2
18.246492	33.31	47.30	109.27	129.74	4285	2
18.316366	24.50	43.47	112.12	128.73	4356	3
18.457546	22.12	46.41	106.28	123.66	4321	3
18.522362	20.76	47.87	98.75	121.29	3561	4
18.609608	19.37	51.90	99.65	124.48	3327	4
18.671272	18.62	41.55	109.66	128.41	4042	5
18.740788	18.15	36.30	105.59	121.86	4174	5
18.811539	24.43	36.29	107.82	126.97	4284	3
18.883368	30.41	41.81	103.46	127.41	4502	3
18.955000	38.09	47.71	107.54	135.83	4622	3
18.993786	23.55	42.88	162.30	172.25	711	3
19.031424	45.84	50.57	36.24	86.16	3517	3
19.096296	42.17	48.43	52.71	94.30	4009	3
19.166979	35.15	46.13	47.91	83.26	4094	2

19.307014	27.37	36.91	51.10	75.39	4379	3
19.377256	24.12	34.53	54.56	74.97	4419	2
19.447824	22.31	38.61	54.53	75.94	4303	2
19.519352	25.29	43.80	51.77	79.70	4354	3
19.590973	21.31	45.72	50.63	80.45	4293	3
19.661667	18.60	45.02	44.88	75.27	4086	5
19.731134	19.25	35.20	45.75	70.86	4141	5
19.801805	23.86	34.96	46.60	70.70	4276	7
19.873634	29.40	39.29	64.59	92.77	4461	7
19.945162	36.58	48.19	54.21	95.25	4624	15
19.986528	43.03	38.30	55.57	95.11	962	15
20.023750	39.64	47.23	38.91	81.20	3395	9
20.086515	40.63	49.17	49.60	91.41	4010	9
20.227303	30.99	46.17	51.07	81.95	4229	6
20.297270	27.01	39.83	50.71	76.79	4384	9
20.367617	21.37	32.28	54.98	73.14	4429	9
20.438112	22.19	37.91	46.67	70.85	4326	7
20.509340	22.47	39.38	55.87	78.98	4326	15
20.581169	22.31	43.98	49.46	81.66	4324	15
20.652014	20.39	39.85	47.67	74.69	4116	9
20.721413	18.99	32.61	42.22	67.30	4113	9
20.792025	24.11	36.41	52.76	79.74	4276	22
20.868761	30.86	44.38	55.66	86.25	3810	22
20.935347	36.76	40.59	44.64	81.49	4614	6
20.985209	38.26	45.70	81.17	111.93	1794	6
21.019978	42.10	40.08	71.17	101.56	2603	3
21.076725	40.30	50.36	110.54	138.06	4024	3
21.147615	36.81	51.02	109.63	134.54	4066	0
21.217709	34.85	48.80	111.90	133.61	4210	0
21.357927	24.92	38.03	106.04	120.76	4428	0
21.428379	23.72	39.51	102.51	117.65	4364	2
21.580256	22.07	44.91	92.52	113.56	3358	3
21.642406	20.75	38.88	112.28	127.44	4149	2
21.711840	19.78	34.26	108.86	124.69	4064	2
21.782291	24.18	33.74	100.16	118.04	4261	0
21.853691	27.61	33.72	100.63	119.45	4376	0
21.925497	35.40	38.95	100.82	123.59	4608	2
21.981632	38.18	49.02	112.03	138.16	2629	2
22.017164	40.04	28.61	40.28	69.67	1777	5
22.137917	38.56	48.01	47.32	86.97	4048	9
22.208078	31.86	42.94	52.35	82.63	4194	9
22.278009	28.64	37.32	56.93	80.62	4345	9
22.348228	20.78	34.21	45.88	67.41	4412	9
22.418680	21.01	37.66	54.20	75.44	4387	15
22.489340	19.87	35.89	47.07	70.01	4254	15
22.561562	24.59	42.98	51.61	82.03	4358	18
22.632662	22.10	34.65	53.60	76.57	4180	18
22.702280	19.07	36.15	45.04	70.27	4020	18
22.772558	25.60	61.62	43.91	92.31	4246	56
22.843565	29.65	71.19	70.51	116.64	4300	56
22.915522	40.55	96.91	60.88	133.04	4541	48
22.975348	52.73	89.91	55.62	132.40	3124	48
23.012106	30.41	95.27	105.51	166.51	1313	94
23.056238	42.17	91.38	70.09	137.68	4186	94
23.128263	42.61	91.73	68.77	137.39	4022	67
23.198471	39.00	74.97	72.77	122.55	4175	67
23.268414	33.72	61.80	76.73	114.79	4326	7
23.338436	28.27	56.56	78.37	111.82	4393	7
23.408981	30.12	59.44	68.84	109.41	4397	22
23.560637	26.99	68.63	60.42	107.68	3381	22
23.622929	22.27	61.61	68.29	109.72	4203	22
23.692883	23.44	54.61	71.04	105.20	3916	12
23.734375	33.73	38.46	87.15	117.01	1003	12
24.005220	41.00	38.83	54.65	85.84	889	6
24.046204	46.07	58.30	59.81	107.31	4206	6
24.118553	47.27	62.41	64.63	112.81	4029	6
24.327593	24.25	49.47	60.34	92.11	4143	27
24.550764	17.60	54.48	58.86	92.63	3380	9
24.613253	22.17	57.06	68.36	104.54	4238	9
24.683346	16.51	48.22	69.94	99.22	3943	9
24.753147	21.59	45.47	64.62	96.02	4216	9

24.824085	24.82	48.13	58.10	92.40	4282	9
24.895914	29.61	54.46	69.63	106.57	4522	15
24.966204	36.80	56.65	68.32	108.83	4419	15
25.000717	33.64	84.86	18.38	93.37	117	7
25.037489	33.04	56.09	42.11	87.77	4290	7
25.109873	34.05	57.03	47.89	92.42	4023	7
25.250174	27.68	47.15	50.45	84.75	4283	7
25.320023	19.51	44.34	53.67	80.86	4355	7
25.390614	18.49	40.35	51.25	77.06	4414	5
25.461250	20.41	44.39	47.14	77.81	4315	5
25.533068	19.52	50.38	55.66	87.01	4377	4
25.604490	19.50	51.39	48.96	83.83	4258	4
25.674965	17.03	43.89	48.19	77.54	4022	5
25.744469	19.15	41.30	53.84	83.31	4183	5
25.815243	23.71	40.38	55.08	82.45	4281	9
25.889399	28.44	45.92	53.13	85.56	4174	6
25.958633	33.50	47.58	47.09	87.06	4622	6
25.996529	22.82	35.21	91.90	105.70	593	6
26.033714	37.75	52.52	42.52	87.00	3640	7
26.099051	35.66	52.65	42.61	86.07	4009	7
26.239607	28.60	48.81	53.92	86.65	4260	15
26.309538	20.80	39.60	49.93	74.12	4379	7
26.379976	20.63	38.57	51.09	75.07	4419	5
26.450567	19.97	36.57	51.75	73.09	4308	5
26.522211	19.07	45.33	60.79	86.80	4370	4
26.593727	20.41	44.93	45.83	75.01	4298	4
26.664433	16.39	41.02	54.40	78.83	4073	4
26.733843	18.44	35.67	49.97	76.33	4151	4
26.804560	23.04	38.43	46.73	75.77	4281	5
26.876366	25.56	45.75	53.60	87.37	4470	15
26.947950	35.11	53.20	49.03	93.26	4624	15
26.989351	44.83	40.00	70.25	108.96	968	15
27.026564	33.31	55.38	26.70	77.01	3385	18
27.089226	34.02	46.48	13.21	64.51	4003	18
27.160000	29.47	45.79	17.63	63.10	4082	9
27.230036	29.71	41.62	12.21	58.49	4239	9
27.299976	22.58	35.72	11.06	48.66	4377	6
27.370277	19.77	29.91	16.11	44.25	4423	6
27.440809	18.60	31.08	21.06	46.23	4332	7
27.512211	19.27	39.68	17.28	54.04	4342	15
27.583958	20.01	43.11	25.41	60.43	4322	15
27.654825	20.49	51.52	26.35	66.57	4114	15
27.724213	19.71	38.88	17.23	52.12	4115	15
27.794792	21.91	46.43	22.95	62.49	4274	32
27.866411	24.04	51.48	35.75	73.97	4458	32
27.938137	32.63	56.79	38.64	84.35	4611	32
27.985914	38.06	73.84	31.21	97.59	1560	32
28.021389	32.23	49.34	29.13	74.79	2892	48
28.080521	34.56	52.63	30.29	77.01	4019	48
28.151377	29.82	48.76	17.95	65.92	4072	48
28.221399	28.78	45.03	24.77	66.52	4217	48
28.291285	22.80	41.16	17.16	55.68	4355	32
28.361586	17.74	35.47	25.55	54.77	4430	32
28.432095	19.93	40.53	13.11	52.32	4353	22
28.502928	19.69	48.34	32.78	67.61	4255	32
28.575104	23.28	48.79	25.73	66.72	4330	32
28.646088	20.44	55.48	29.22	71.70	4143	22
28.715578	17.50	47.99	26.06	63.86	4074	22
28.785995	23.80	41.48	26.80	64.12	4269	18
28.857443	24.38	42.85	25.42	63.43	4408	18
28.929201	31.76	57.08	43.67	89.23	4622	32
28.983160	43.72	58.81	59.90	104.52	2331	32
29.018206	32.49	47.66	43.71	78.21	2077	32
29.070278	33.90	51.22	25.11	72.42	4103	32
29.141678	31.19	46.32	15.22	63.78	4052	27
29.211805	30.19	44.04	17.34	62.56	4200	27
29.281691	27.34	40.46	11.66	54.90	4353	32
29.351864	18.88	43.58	20.94	56.69	4421	32
29.422384	19.19	37.67	20.72	52.89	4383	27
29.493010	17.96	40.09	32.89	59.74	4243	27
29.565313	23.27	49.28	37.80	72.74	4350	32

29.636389	19.69	51.26	27.18	67.08	4172	39
29.705996	17.93	56.61	39.35	79.46	4028	39
29.776297	24.06	51.03	28.47	72.45	4253	32
29.851019	18.40	39.61	21.49	56.81	3374	32
29.919271	31.88	47.88	25.13	70.59	4550	22
29.977316	36.13	51.01	30.61	78.85	2904	22
30.013830	39.30	50.60	47.47	88.06	1526	12
30.060068	34.67	51.02	42.89	84.82	4177	12
30.131990	34.66	48.97	50.73	87.41	4018	12
30.202175	30.42	48.37	53.62	85.74	4179	12
30.272072	26.92	41.26	53.33	78.99	4332	18
30.412674	19.73	36.90	53.16	75.00	4390	7
30.483379	21.49	43.27	47.78	76.83	4266	7
30.555555	24.33	51.14	53.94	88.68	4373	18
30.626678	22.41	47.34	49.34	83.14	4206	15
30.696712	16.74	40.85	57.49	83.33	3914	15
30.766678	20.94	46.79	49.20	83.82	4219	22
30.837568	24.10	49.38	54.69	89.31	4290	22
30.909445	34.17	48.14	51.94	90.92	4525	15
30.969803	39.10	50.17	51.48	93.82	3198	15
31.006922	31.55	34.34	70.79	93.34	1182	18
31.050047	36.39	55.18	100.19	132.10	4211	18
31.122351	37.39	52.29	108.91	136.91	4037	18
31.192570	31.28	51.99	109.08	131.76	4167	9
31.332455	21.97	43.50	111.60	128.32	4381	12
31.403009	23.44	46.36	107.04	125.27	4404	9
31.473635	21.20	44.80	100.00	118.00	4285	9
31.545612	24.90	44.81	100.91	123.16	4370	9
31.616968	23.39	47.52	107.12	130.97	4234	9
31.686920	17.98	39.57	116.70	133.81	3913	12
31.833530	28.71	41.58	94.23	117.39	3598	7
31.899572	31.84	43.59	101.49	125.22	4521	7
31.967604	38.29	43.66	105.73	131.12	4127	7
32.002094	45.52	41.63	14.16	64.39	353	9
32.040207	38.62	45.05	45.87	84.34	4264	9
32.112579	42.12	48.81	50.06	92.25	4022	9
32.182953	34.68	47.76	52.97	87.03	4136	5
32.252834	32.44	42.76	54.68	83.41	4288	7
32.322765	23.42	37.34	57.47	78.20	4357	7
32.393345	23.31	37.82	56.33	76.70	4411	3
32.463947	23.37	39.17	47.08	71.77	4312	3
32.535824	25.60	49.99	49.08	82.76	4375	15
32.607224	24.18	44.36	46.88	81.00	4254	15
32.754433	22.11	40.39	51.65	80.88	3376	9
32.818008	25.86	39.11	48.29	77.76	4279	9
32.889755	30.79	41.08	52.42	83.79	4500	12
32.961376	37.60	42.94	49.28	86.49	4606	12
32.997906	28.70	37.93	56.04	80.86	355	12
33.034733	43.27	49.67	17.18	75.41	3903	9
33.102825	42.80	45.56	18.28	71.76	4009	9
33.173428	37.57	42.81	18.06	66.49	4102	5
33.243263	31.94	38.58	12.68	57.68	4267	5
33.313217	27.79	37.79	14.74	54.83	4386	3
33.383671	23.24	33.33	13.72	48.19	4421	6
33.454224	24.47	34.24	19.05	53.04	4322	6
33.525970	26.64	42.21	32.63	67.45	4376	12
33.597443	23.08	47.35	19.22	61.60	4298	12
33.668079	21.98	47.88	26.35	64.73	4058	18
33.737568	21.92	42.32	29.37	61.62	4153	18
33.808250	25.90	40.83	14.36	58.58	4271	7
33.880024	31.20	42.76	17.51	63.12	4488	7
33.951595	39.11	39.94	19.25	65.67	4619	7
33.991528	33.49	39.43	10.94	59.68	790	7
34.029064	40.31	46.24	41.26	83.41	3477	4
34.093021	43.39	50.37	45.47	89.73	4007	4
34.233681	33.55	45.82	55.46	86.25	4243	4
34.303600	27.59	40.49	51.30	77.34	4373	9
34.373981	23.66	38.26	49.22	72.69	4423	9
34.444572	24.54	38.03	53.68	76.57	4325	5
34.515949	26.25	41.34	42.66	72.32	4347	15
34.587627	26.95	50.12	55.38	89.05	4312	15

34.658447	23.11	40.03	47.85	74.84	4107	12
34.727905	21.24	38.69	53.26	79.54	4119	12
34.798485	26.71	38.93	55.19	84.23	4282	12
34.870140	30.17	45.26	52.85	88.82	4464	12
34.941296	37.86	46.14	46.81	87.06	4484	22
34.986889	37.24	56.28	68.28	108.97	1247	22
35.022442	28.74	40.11	17.13	59.16	3115	7
35.083275	29.89	44.86	17.70	63.22	4018	7
35.154133	27.57	44.33	13.39	59.47	4071	5
35.224098	26.13	41.26	17.44	57.50	4223	5
35.293968	21.51	35.47	15.37	49.92	4353	7
35.364258	18.97	33.47	13.74	44.74	4426	7
35.514469	15.48	31.92	20.67	46.32	3305	4
35.577847	23.05	43.20	19.44	57.33	4331	4
35.648750	20.58	43.70	20.19	57.32	4124	4
35.718220	19.99	40.66	18.07	53.52	4094	4
35.788750	21.88	40.52	20.66	57.17	4271	3
35.860268	22.76	41.21	13.15	54.48	4419	3
35.931919	30.33	43.31	22.96	65.10	4614	7
35.984200	35.86	50.28	16.65	73.61	2087	7
36.018970	28.01	31.88	12.93	49.45	2318	4
36.073242	29.60	44.29	19.96	63.58	4053	4
36.144398	26.73	44.93	14.64	60.06	4057	2
36.214493	26.40	40.78	7.38	53.84	4203	2
36.284374	23.12	36.83	10.16	49.52	4347	2
36.354515	18.34	32.18	13.03	43.43	4425	2
36.425102	17.45	32.49	12.28	43.38	4372	4
36.495789	18.59	34.24	26.10	52.78	4248	4
36.568138	23.70	45.06	21.36	60.11	4345	4
36.639118	23.22	41.86	18.85	57.91	4171	15
36.708706	18.97	43.25	18.22	54.94	4041	15
36.778992	24.11	52.19	41.45	79.81	4253	32
36.850243	26.80	61.87	37.41	91.97	4345	32
36.922050	30.80	49.83	27.56	77.34	4567	32
36.980278	30.23	48.32	21.68	69.25	2930	32
37.016701	25.08	56.84	17.03	70.50	1516	39
37.062904	30.03	56.15	19.17	72.80	4163	39
37.134758	27.28	55.48	14.50	68.68	4030	48
37.204861	26.50	47.54	22.56	65.52	4186	48
37.274769	22.39	40.19	11.67	52.80	4337	22
37.344837	19.01	39.54	10.28	49.22	4406	22
37.415405	18.10	37.67	18.15	51.28	4387	32
37.486088	19.02	38.44	28.12	56.92	4257	32
37.558300	22.76	50.21	17.78	63.25	4374	27
37.629444	22.63	54.74	27.48	70.72	4206	18
37.699306	21.77	54.88	39.17	80.87	3943	18
37.769260	27.26	59.16	38.95	85.46	4249	39
37.840324	23.43	53.11	32.25	78.69	4291	39
37.912140	29.66	52.81	24.65	74.73	4532	48
37.972443	40.08	71.19	39.31	101.40	3199	48
38.009315	28.51	45.99	44.88	83.07	1253	56
38.052814	32.02	51.62	36.60	80.57	4210	56
38.125034	30.34	55.82	18.92	71.00	4031	22
38.195267	31.03	46.90	19.37	63.66	4164	22
38.265148	26.76	45.13	21.65	61.52	4313	22
38.335163	20.41	38.20	24.70	57.77	4379	22
38.405704	18.02	35.61	21.68	53.12	4396	27
38.476376	20.12	37.17	20.38	52.45	4277	27
38.548405	26.08	59.37	29.62	78.64	4376	39
38.619675	23.32	54.05	43.77	81.84	4222	39
38.689663	19.73	55.57	23.55	71.61	3913	27
38.759594	22.79	55.51	39.33	80.68	4216	27
38.830532	25.25	48.26	29.90	73.90	4288	27
38.902290	31.65	48.48	30.59	74.50	4517	27
38.968449	34.20	49.29	24.73	73.25	3884	27
39.003483	40.27	50.38	4.92	65.96	593	22
39.042881	36.91	49.31	33.89	78.36	4228	22
39.115322	37.16	48.93	14.64	68.89	4023	22
39.185612	32.72	46.13	12.43	63.71	4149	18
39.252987	28.24	40.44	11.42	55.40	3968	6
39.325462	23.07	36.76	18.85	52.62	4355	6

39.396065	21.76	34.41	22.93	54.01	4405	12
39.466667	21.83	37.07	29.52	59.76	4300	12
39.538612	23.64	47.80	18.60	62.67	4385	15
39.609955	22.33	56.59	21.15	69.92	4250	15
39.680267	19.94	44.55	18.33	57.80	3990	15
39.749897	22.06	43.62	30.96	66.79	4199	15
39.820763	26.62	43.81	39.05	75.15	4282	22
39.892548	30.54	49.89	38.49	77.40	4510	12
39.964085	35.95	44.19	8.84	63.57	4609	12
39.999294	19.33	67.61	3.47	70.68	117	12
40.035393	39.52	44.81	16.31	68.47	4125	6
40.105534	41.71	48.97	13.12	71.51	4018	6
40.176125	34.84	49.37	21.47	70.71	4107	15
40.245983	32.11	43.90	18.82	61.80	4271	15
40.315811	23.31	36.53	12.69	50.40	4347	12
40.386425	24.01	38.96	10.83	51.86	4428	5
40.456921	24.49	38.60	20.48	55.64	4322	5
40.528706	23.22	43.08	25.98	61.39	4378	15
40.600197	22.62	55.99	34.56	78.18	4283	15
40.670776	18.40	49.75	17.51	63.75	4048	22
40.740265	20.33	38.36	23.28	58.24	4154	22
40.811020	23.77	40.99	15.93	57.45	4269	7
40.882801	31.25	45.67	23.53	67.66	4498	6
40.954365	35.68	53.83	25.80	77.84	4625	6
40.992939	23.63	44.94	12.14	55.90	694	6
41.030766	41.90	44.40	15.92	69.88	3626	12
41.095753	39.34	47.21	16.69	70.21	4010	12
41.166470	35.24	46.01	22.62	69.11	4090	9
41.236378	31.37	46.45	16.30	64.21	4247	9
41.306309	24.66	37.44	17.88	53.83	4375	15
41.376690	23.49	38.13	13.89	51.61	4413	6
41.447292	22.61	38.02	17.98	52.91	4325	6
41.518795	22.66	44.54	23.39	62.09	4363	7
41.590405	22.14	48.14	14.66	60.10	4313	7
41.661182	19.62	41.87	20.76	57.46	4096	9
41.730579	19.42	39.48	22.21	55.34	4139	9
41.801228	24.79	39.88	20.41	58.33	4275	7
41.872963	30.62	45.67	23.70	66.04	4473	7
41.944561	36.96	55.16	25.95	78.88	4623	18
41.986816	43.50	45.89	16.53	71.96	1020	18
42.023506	36.99	42.92	15.13	65.08	3342	15
42.085960	38.27	48.13	12.77	68.84	4004	15
42.156818	32.57	53.43	16.10	70.74	4080	32
42.226772	30.59	43.10	10.68	58.15	4223	32
42.296677	26.73	39.21	18.72	56.62	4355	12
42.366886	22.37	38.85	14.04	51.54	4416	12
42.437546	23.02	41.75	19.16	56.12	4343	12
42.508797	20.50	44.01	22.51	59.55	4323	9
42.580589	19.99	48.81	20.79	61.77	4314	9
42.651493	18.49	53.44	31.38	72.45	4125	15
42.727013	23.36	53.25	31.61	74.66	3397	15
42.791492	26.46	43.94	15.51	61.39	4272	12
42.862892	30.03	49.94	25.16	70.49	4457	12
42.934746	37.12	56.85	19.56	77.86	4625	32
42.985126	43.32	51.13	14.07	75.27	1857	32
43.019836	37.11	74.78	80.20	130.26	2549	80
43.076180	34.75	71.37	61.55	112.23	4022	80
43.147095	32.74	68.86	44.83	99.49	4057	80
43.217186	31.68	52.90	45.40	85.09	4209	80
43.293968	28.49	55.26	49.51	86.50	3518	80
43.357258	21.24	69.34	70.40	112.83	4424	80
43.427837	22.04	110.71	93.92	163.08	4369	111
43.498646	26.90	119.69	69.21	159.77	4221	111
43.570831	26.95	95.23	49.12	126.84	4345	67
43.641830	25.44	84.17	60.42	122.22	4158	32
43.788311	37.39	83.73	51.91	122.44	3500	18
43.853065	35.31	75.13	47.04	111.36	4374	18
43.924816	42.94	72.59	63.66	121.98	4569	15
43.981445	44.82	72.93	54.67	116.26	2690	15
44.017258	40.01	56.97	54.56	98.45	1722	18
44.065765	40.37	68.88	52.53	105.55	4139	18

44.137478	37.96	67.15	45.04	98.03	4030	7
44.207581	38.12	55.01	47.45	91.22	4190	7
44.347580	25.21	55.43	51.75	89.64	4407	12
44.418125	22.62	48.61	54.99	86.46	4376	22
44.488796	22.14	55.82	57.84	92.55	4264	22
44.560993	25.00	59.43	44.80	87.64	4357	18
44.632175	24.05	64.23	46.69	94.85	4194	18
44.701805	25.38	58.66	44.98	90.03	4004	18
44.771980	28.69	50.99	50.44	90.24	4251	9
44.843056	32.09	51.22	52.62	92.92	4300	9
44.914860	37.33	55.33	56.18	99.50	4524	12
44.975243	41.32	65.17	55.46	106.67	3197	12
45.012074	31.38	44.41	34.43	70.21	1252	22
45.055626	40.67	56.32	21.56	78.24	4204	22
45.127754	39.35	60.00	18.66	80.44	4031	32
45.197964	36.26	49.36	10.08	66.70	4175	32
45.267872	32.82	50.27	14.34	66.64	4320	27
45.337906	22.85	49.00	18.78	64.35	4392	27
45.408463	20.70	42.39	19.94	57.54	4395	32
45.479118	20.18	50.01	34.58	71.71	4277	32
45.551159	26.81	72.35	45.94	99.60	4373	56
45.622433	22.56	65.24	24.10	80.25	4216	56
45.692371	21.95	55.75	19.52	71.79	3905	39
45.762337	27.60	59.36	35.23	86.49	4225	27
45.833252	34.39	60.90	26.77	87.36	4281	27
45.905094	38.81	59.06	31.17	87.99	4524	27
45.969131	40.83	55.45	30.96	87.56	3629	27
46.004848	34.98	58.28	38.27	80.77	829	27
46.045692	38.66	59.89	29.69	82.19	4232	27
46.118046	40.78	58.07	18.07	79.17	4024	27
46.188416	35.80	51.61	21.02	70.98	4149	27
46.258240	33.35	48.35	9.40	63.82	4295	9
46.328205	25.01	41.59	16.64	57.23	4369	9
46.398796	26.56	43.46	18.48	60.10	4410	6
46.469006	19.45	46.33	17.15	56.54	4048	6
46.542301	23.74	50.81	17.13	63.32	3952	9
46.612755	23.25	50.83	14.90	63.71	4248	9
46.682976	19.20	46.61	14.08	56.87	3978	7
46.752651	23.22	47.02	16.52	61.58	4211	22
46.823544	28.50	44.27	95.95	121.56	4282	22
46.895359	25.57	47.49	107.42	132.21	4504	32
46.966087	29.27	55.46	140.32	170.68	4490	32
47.036030	26.46	52.13	151.83	174.09	4310	12
47.108322	37.88	51.55	168.65	190.64	4020	12
47.178806	45.73	54.32	182.32	206.55	4124	9
47.248669	45.65	55.78	174.46	198.63	4279	9
47.318577	35.15	56.05	184.63	205.54	4349	4
47.389179	31.68	51.11	191.18	209.29	4423	3
47.459663	31.02	47.95	204.73	220.78	4319	3
47.531528	33.15	47.24	230.33	246.08	4373	7
47.603020	35.90	52.25	253.29	270.46	4279	7
47.673496	20.27	61.75	204.18	221.92	4032	9
47.743019	24.46	45.88	71.34	96.85	4174	9
47.813797	26.10	53.72	45.40	82.81	4272	7
47.885567	27.53	50.73	36.99	76.44	4511	5
47.957119	30.88	50.73	38.24	77.80	4613	5
47.995823	26.14	46.34	48.52	77.92	710	5
48.033508	32.32	51.49	40.11	81.01	3599	3
48.098541	29.92	53.16	51.16	87.75	4012	3
48.169212	26.45	48.04	45.58	77.65	4098	3
48.239098	23.56	43.10	51.55	77.22	4263	3
48.309074	19.39	39.41	52.54	74.98	4374	4
48.379501	17.81	40.14	57.77	78.63	4434	12
48.450047	17.44	39.60	62.91	82.74	4315	12
48.521572	21.64	45.25	46.10	76.38	4357	9
48.593193	25.34	56.54	51.63	89.31	4302	9
48.663898	21.57	52.07	49.01	84.37	4079	6
48.733356	23.98	50.29	57.24	90.37	4148	6
48.881042	25.85	50.06	55.41	89.57	3842	3
48.947350	31.43	52.19	47.12	86.37	4615	3
48.988483	43.65	52.39	58.25	103.31	935	3

49.025707	27.41	48.00	13.74	62.88	3433	0
49.088760	28.87	51.60	14.54	67.83	4010	0
49.159550	25.43	50.01	16.79	65.38	4075	2
49.229538	23.60	42.12	10.69	53.40	4232	2
49.299435	20.25	40.34	10.11	50.75	4368	2
49.369698	18.01	36.24	14.34	47.51	4424	2
49.440357	18.45	38.49	16.75	50.86	4346	2
49.511597	20.72	43.65	16.41	55.70	4325	2
49.583412	24.06	52.03	17.25	65.23	4322	2
49.654305	21.21	49.70	12.63	59.63	4125	0
49.723694	23.80	45.33	10.96	57.36	4118	0
49.794247	26.05	43.56	18.09	59.91	4271	2
49.865742	25.80	47.79	18.81	63.12	4467	2
49.937523	30.69	49.41	14.25	66.06	4624	0
49.985985	37.28	54.10	17.14	77.22	1613	0
50.020832	26.18	39.81	15.56	54.92	2778	0
50.078995	28.34	48.32	14.20	63.60	4018	0
50.149872	25.87	49.32	15.50	64.16	4067	0
50.219906	23.38	43.27	13.88	55.35	4211	0
50.289791	19.84	40.98	12.54	51.37	4337	5
50.360035	17.84	34.79	14.04	46.45	4425	5
50.430603	18.85	34.51	17.12	49.18	4357	7
50.501389	21.10	38.42	17.23	52.03	4247	3
50.573647	24.14	46.76	27.79	68.14	4337	3
50.644608	22.17	46.19	19.37	60.77	4149	3
50.714119	23.24	43.44	12.93	55.63	4065	3
50.784527	25.31	43.30	12.37	56.19	4267	3
50.855904	24.37	44.92	18.16	60.68	4388	3
50.927593	29.77	48.24	15.44	66.88	4566	3
50.982571	30.23	52.27	12.56	68.29	2454	3
51.017845	30.28	37.57	17.18	55.74	1953	2
51.068691	29.07	49.75	14.71	65.11	4113	2
51.140278	27.14	47.92	21.06	65.43	4043	3
51.210335	24.58	45.32	17.19	59.31	4193	3
51.280209	22.33	42.10	11.27	53.26	4337	6
51.350346	17.62	34.36	19.26	48.37	4412	6
51.420914	19.36	35.94	17.96	49.72	4375	4
51.491619	20.53	36.58	12.53	48.14	4262	4
51.563797	24.26	48.34	15.94	61.46	4354	2
51.634930	23.17	48.69	13.12	60.56	4173	0
51.704548	20.62	46.39	15.27	57.80	4019	0
51.774757	24.14	43.37	17.22	58.63	4241	4
51.845856	22.97	46.20	14.58	59.41	4303	4
51.917641	30.82	53.40	19.54	71.75	4520	22
51.975971	28.32	58.77	12.13	72.13	2925	22
52.012730	36.51	41.45	29.26	72.67	1490	22
52.058449	28.29	51.54	15.02	67.33	4185	22
52.130531	25.41	54.29	19.34	69.84	4036	39
52.200684	21.26	50.24	20.48	64.42	4171	39
52.270626	19.85	46.61	16.35	58.21	4328	15
52.340683	17.00	40.60	17.33	51.33	4397	15
52.411240	18.89	36.63	22.31	54.45	4392	12
52.481899	19.61	36.93	14.71	49.86	4271	12
52.554028	24.02	51.32	19.31	65.09	4378	22
52.625198	24.55	56.94	25.28	71.92	4209	39
52.695198	19.26	43.96	20.08	59.31	3909	39
52.765102	25.49	42.20	23.86	62.86	4232	12
52.836063	25.21	44.25	10.21	58.36	4288	12
52.907917	29.92	48.22	19.04	68.54	4525	7
52.969860	30.85	59.99	21.55	79.21	3383	7
53.006248	34.18	27.46	11.00	47.85	1069	7
53.048519	31.54	47.75	19.81	66.78	4208	7
53.120800	30.99	48.59	16.75	66.90	4021	7
53.191158	28.60	45.09	15.49	61.16	4146	9
53.258728	23.04	43.35	17.75	57.85	4025	3
53.331005	19.23	38.34	18.95	51.73	4370	3
53.401562	19.72	37.29	15.96	49.43	4404	3
53.472187	20.04	37.22	18.37	52.43	4288	3
53.544155	23.72	44.55	20.59	60.15	4375	7
53.615475	23.76	44.44	20.78	59.57	4231	7
53.685520	19.33	47.52	16.36	58.13	3933	6

53.755417	28.55	44.72	20.25	62.81	4211	4
53.826298	24.42	42.84	20.01	59.94	4276	4
53.898113	25.92	42.72	25.31	62.37	4517	6
53.967049	27.06	45.57	22.85	63.73	4248	6
54.001400	24.17	38.02	10.86	46.86	235	7
54.038715	23.98	44.98	23.53	62.61	4265	7
54.111111	25.30	43.58	22.76	62.08	4021	7
54.181576	22.39	43.37	22.10	59.95	4124	3
54.251423	20.91	42.09	12.02	52.77	4287	6
54.321320	17.08	42.44	17.86	53.25	4351	6
54.391945	15.90	39.26	18.12	50.77	4417	15
54.462418	17.72	43.09	20.91	56.26	4317	15
54.534363	20.43	51.98	42.77	80.22	4382	27
54.605728	25.53	48.25	28.98	68.67	4261	27
54.676193	22.51	49.57	18.35	62.64	4013	18
54.745716	27.59	44.32	21.00	62.88	4178	18
54.816551	26.52	44.16	23.52	63.22	4278	4
54.888287	26.28	48.02	29.39	68.96	4495	6
54.959873	25.71	45.57	25.95	65.51	4613	6
54.997211	40.84	36.22	15.80	63.70	473	6
55.034271	21.68	48.67	27.79	66.35	3802	15
55.101295	22.21	43.24	25.01	61.74	4010	15
55.171898	21.41	47.65	23.37	63.55	4103	39
55.241829	18.56	45.10	13.93	56.65	4268	39
55.311760	16.63	37.39	14.82	48.26	4370	22
55.382271	17.74	41.09	17.82	53.91	4430	39
55.452766	18.63	38.34	13.69	50.21	4328	39
55.524467	21.32	42.68	26.16	62.01	4373	27
55.595963	29.78	54.93	26.93	76.55	4289	27
55.666668	24.89	53.59	23.87	70.95	4073	27
55.736111	29.80	58.27	25.21	77.93	4148	27
55.806839	24.21	48.95	20.08	63.88	4274	32
55.878624	26.55	51.18	36.01	75.39	4481	39
55.950161	31.85	44.92	28.72	70.96	4627	39
55.991215	42.30	51.95	26.29	80.17	929	39
56.028461	30.93	47.26	35.01	74.49	3418	22
56.091576	31.86	44.91	30.69	70.76	4019	22
56.162270	27.99	49.67	32.89	73.18	4090	32
56.232246	26.72	41.74	24.11	60.87	4247	32
56.302162	22.13	46.70	19.28	60.73	4366	27
56.372440	18.24	33.84	21.54	48.78	4428	27
56.443111	17.45	35.78	19.33	51.08	4338	18
56.514469	19.63	45.75	31.95	66.00	4350	22
56.586205	21.53	46.22	20.32	60.77	4321	22
56.657013	18.06	45.31	19.06	57.74	4118	18
56.726425	20.02	43.76	25.13	59.61	4117	18
56.797050	22.25	40.87	21.48	58.77	4277	9
56.868530	23.54	40.80	29.79	63.28	4480	9
56.940346	30.62	46.01	29.27	69.62	4617	15
56.986572	32.68	50.53	31.13	74.91	1380	15
57.021889	30.81	41.88	40.81	74.19	3002	15
57.081760	32.41	47.78	40.82	80.04	4016	15
57.152546	28.15	48.79	42.46	77.71	4062	12
57.362778	18.81	36.15	50.54	71.09	4422	15
57.433369	17.23	36.94	49.17	70.79	4354	18
57.512280	18.13	37.66	44.87	67.65	3335	7
57.576378	22.17	45.22	47.73	77.97	4327	7
57.647339	18.83	42.87	47.97	73.95	4141	15
57.716827	18.94	41.03	51.73	78.45	4084	15
57.787327	24.04	44.14	47.70	80.09	4268	27
57.858784	24.10	52.90	50.09	86.76	4404	27
57.930557	29.15	46.59	41.81	79.06	4621	18
57.983646	28.61	58.80	43.69	89.25	2212	18
58.018505	35.92	43.68	27.37	70.88	2200	22
58.071598	30.55	47.32	27.07	69.09	4098	22
58.142963	27.65	47.19	26.06	66.72	4019	7
58.213196	26.10	43.41	20.80	59.98	4184	7
58.282963	24.03	42.80	15.22	56.43	4334	9
58.353138	18.83	36.23	16.20	48.55	4425	9
58.423634	17.42	36.02	15.72	47.60	4366	15
58.494362	18.30	34.02	21.46	50.37	4257	15

58.566608	24.30	44.81	26.82	64.18	4346	18
58.637684	20.46	47.42	23.85	62.15	4171	15
58.707233	19.52	43.69	24.74	58.97	4034	15
58.777557	20.84	43.93	23.79	59.19	4257	9
58.848682	20.28	44.46	22.05	59.56	4324	9
58.920635	30.00	47.24	26.60	68.13	4573	9
58.978737	25.75	48.84	32.70	71.14	2917	9
59.015301	35.87	31.36	10.05	54.49	1513	15
59.061295	30.61	44.53	24.99	65.91	4184	15
59.133308	28.96	51.75	35.83	75.83	4037	27
59.203506	27.09	42.78	28.76	64.70	4165	27
59.273357	22.67	37.08	18.29	53.03	4326	15
59.343449	17.88	39.93	18.87	54.07	4397	15
59.413971	18.48	38.62	23.55	53.98	4390	15
59.484642	20.29	42.46	30.20	62.86	4260	15
59.556850	26.32	52.99	34.38	78.18	4379	27
59.628021	27.36	47.54	20.62	64.57	4210	12
59.697987	27.02	49.41	19.80	65.24	3930	12
59.767838	27.79	47.95	23.61	66.69	4247	7
59.838856	24.32	45.23	24.77	64.29	4297	7
59.910706	29.25	47.76	30.73	71.36	4533	9
59.971237	30.07	47.63	31.67	73.30	3223	9
60.008091	27.37	32.17	38.03	64.01	1233	3
60.051388	25.80	50.12	39.32	76.31	4218	3
60.123600	23.76	48.51	41.76	75.43	4025	3
60.193935	25.23	41.90	41.23	70.88	4149	5
60.254364	22.50	40.61	42.87	69.35	3222	9
60.333763	17.99	36.64	44.06	67.06	4381	9
60.404316	14.98	33.90	50.05	68.25	4399	15
60.474964	17.82	37.68	48.10	69.87	4287	15
60.546955	21.97	44.99	49.21	77.32	4367	9
60.618275	24.02	46.69	47.48	78.20	4233	9
60.688229	20.12	45.82	49.02	78.33	3911	5
60.835068	22.91	42.42	40.33	70.69	3584	4
60.900913	26.46	41.62	48.15	77.96	4524	5
60.967953	28.36	40.82	46.75	77.20	3993	5
61.002789	39.12	44.51	12.67	62.24	473	9
61.041424	27.16	46.43	27.62	67.94	4241	9
61.113888	26.62	43.68	24.25	63.86	4010	9
61.184307	23.98	46.32	27.21	65.06	4122	22
61.254177	22.29	49.39	32.33	71.52	4287	32
61.324097	17.96	43.95	24.63	61.18	4356	32
61.394688	15.01	38.31	24.00	53.40	4414	22
61.465206	17.28	41.36	27.95	60.31	4311	22
61.537128	20.34	47.79	29.41	67.86	4374	18
61.608528	24.79	49.31	39.75	79.19	4257	18
61.678867	21.86	54.01	33.70	78.29	3993	18
61.748493	25.79	49.76	22.76	67.89	4198	18
61.819363	24.32	51.51	24.14	68.42	4275	15
61.891125	26.18	47.37	28.63	69.47	4501	32
61.962742	29.88	59.27	25.75	77.65	4596	32
61.998611	22.51	87.02	9.24	92.09	237	32
62.034966	28.70	55.83	42.64	85.54	4010	39
62.104095	28.13	53.98	35.36	77.91	4003	39
62.174675	24.07	46.75	27.42	65.67	4112	18
62.244572	22.07	41.01	16.51	54.45	4268	18
62.314537	18.50	39.39	14.87	51.57	4369	6
62.385036	17.66	34.83	20.31	49.75	4424	4
62.455521	17.32	34.73	18.54	48.17	4329	4
62.527313	20.73	41.03	22.11	57.72	4370	7
62.598785	21.58	46.64	19.62	61.54	4292	7
62.669411	18.18	45.45	18.91	58.07	4057	4
62.738876	23.18	45.02	23.64	61.47	4144	4
62.809643	24.58	42.16	25.32	61.43	4273	3
62.881401	24.77	45.68	30.74	66.39	4486	7
62.952976	28.76	46.66	23.22	65.65	4620	7
62.991550	23.93	46.76	23.11	65.11	694	7
63.029339	29.81	42.74	25.08	65.33	3624	4
63.094376	28.07	44.24	25.10	64.99	4020	4
63.165058	24.74	47.58	22.53	64.04	4097	2
63.234802	24.53	40.91	14.61	54.78	4231	2

63.303715	19.43	40.86	13.80	51.53	4208	2
63.375267	18.15	35.12	16.75	47.50	4425	4
63.445904	16.86	33.04	19.18	46.75	4328	4
63.517281	19.74	38.76	23.13	55.51	4346	7
63.589016	21.97	45.42	23.25	61.53	4319	7
63.659733	19.21	45.21	20.47	58.56	4096	5
63.729225	22.88	44.36	25.30	61.01	4131	5
63.799782	24.20	43.55	22.87	60.29	4265	9
63.871563	23.41	45.34	29.92	65.60	4459	9
63.943138	27.97	44.46	24.60	65.06	4611	6
63.986874	38.43	55.37	31.55	81.26	1137	6
64.022949	24.88	38.92	19.52	57.66	3238	0
64.084557	27.72	45.63	26.99	67.23	4004	0
64.155418	25.28	45.89	24.95	64.66	4078	0
64.225380	24.37	40.67	14.33	54.01	4223	0
64.295303	20.59	40.73	13.87	51.73	4353	2
64.366249	18.10	35.61	14.69	46.62	4333	2
64.436195	16.62	34.88	15.11	45.71	4354	3
64.507271	19.14	37.33	19.75	52.29	4303	6
64.579216	23.06	47.62	20.52	62.46	4329	6
64.650124	20.12	47.12	24.83	62.57	4127	7
64.719574	23.13	42.94	20.80	58.14	4097	7
64.790108	24.86	43.16	23.33	60.49	4269	3
64.861618	24.10	42.34	24.15	61.36	4415	3
64.933334	27.84	43.86	25.32	64.65	4622	3
64.984711	30.35	44.91	30.27	69.05	1978	3
65.019432	27.18	37.66	21.53	59.58	2420	2
65.074539	26.53	43.81	24.49	63.90	4059	2
65.145744	23.68	45.96	24.69	63.38	4062	7
65.215904	23.49	42.15	16.16	55.74	4190	7
65.285706	20.71	37.98	10.74	48.78	4344	3
65.355888	16.82	34.99	16.16	46.45	4425	3
65.426491	16.01	35.23	16.64	46.28	4369	4
65.497154	18.96	35.95	19.26	51.07	4240	4
65.569435	23.61	46.97	19.23	61.72	4348	5
65.640450	21.35	47.61	22.87	62.27	4162	6
65.710014	22.29	45.54	22.08	60.50	4055	6
65.780373	23.35	43.34	23.52	59.91	4258	7
65.851677	21.08	48.14	20.97	62.65	4349	7
65.923370	26.34	49.02	25.96	69.46	4563	15
65.980843	24.83	49.15	32.08	69.65	2822	15
66.017036	35.05	35.15	7.17	54.75	1613	6
66.064224	26.57	46.43	23.77	65.13	4155	6
66.136055	24.24	48.51	23.95	65.44	4051	9
66.206306	23.91	44.97	14.74	58.18	4174	9
66.276123	23.11	41.94	13.40	54.85	4325	15
66.346214	16.28	44.06	28.77	61.86	4406	15
66.416779	13.84	34.68	20.65	47.14	4382	15
66.487480	16.66	39.52	25.98	55.60	4259	15
66.559631	21.95	44.81	20.02	59.41	4368	12
66.630753	22.05	48.19	22.39	62.65	4204	15
66.700615	19.12	47.99	24.25	62.08	3969	15
66.770622	24.14	48.03	33.45	69.96	4251	9
66.841667	22.19	43.59	30.65	65.61	4291	9
66.913475	26.88	43.06	26.75	65.20	4536	15
66.973946	29.45	49.06	31.29	72.79	3206	15
67.010727	34.99	35.23	11.14	55.29	1249	15
67.054176	30.00	50.59	34.12	74.89	4214	15
67.126320	27.32	54.04	39.20	78.48	4039	22
67.196693	26.77	47.87	29.91	68.37	4157	22
67.266502	26.78	45.83	23.14	63.89	4316	18
67.336540	17.71	44.24	23.42	58.68	4387	18
67.407120	15.09	43.00	25.69	57.66	4394	15
67.477768	15.96	36.80	20.09	50.43	4277	15
67.549805	21.43	49.19	26.85	65.73	4371	15
67.621078	24.24	52.57	39.90	78.07	4223	15
67.691063	16.87	46.38	20.43	58.68	3922	15
67.760986	22.96	43.37	21.96	60.67	4218	12
67.831947	22.51	48.85	30.69	68.45	4281	12
67.903740	27.10	50.07	41.47	78.75	4524	18
67.968811	28.89	49.77	30.07	71.42	3758	18

68.004181	43.01	45.00	7.99	65.40	711	9
68.044296	29.68	54.33	26.07	74.02	4233	9
68.116631	31.10	50.54	25.98	70.87	4024	9
68.187073	28.03	47.42	28.90	68.29	4134	12
68.256958	27.08	41.92	13.11	56.03	4295	6
68.326851	20.98	40.64	19.76	55.35	4368	6
68.397453	17.64	39.89	24.93	54.66	4412	15
68.468033	16.98	39.28	24.65	55.31	4308	15
68.539963	20.44	49.83	30.65	67.72	4385	15
68.611351	22.50	51.04	27.16	67.71	4253	15
68.681633	20.16	50.17	24.58	67.06	3987	27
68.751282	21.42	48.89	42.53	80.00	4199	22
68.822166	23.47	56.11	39.49	82.17	4283	22
68.893944	29.24	51.91	31.84	76.65	4509	7
68.965546	34.27	46.90	23.62	70.40	4605	7
69.035645	38.07	51.47	26.78	76.88	4202	9
69.106873	38.25	48.68	29.39	75.54	4021	9
69.177475	32.63	46.23	25.78	67.92	4118	3
69.247330	33.09	43.42	14.42	60.53	4276	3
69.317223	24.74	41.50	17.87	56.76	4352	2
69.387779	23.20	36.29	18.27	53.12	4422	3
69.458313	20.44	35.93	18.16	52.36	4320	3
69.530136	23.83	45.99	19.21	62.08	4376	6
69.601608	23.56	48.52	21.02	64.32	4291	6
69.672142	20.64	45.44	15.69	57.31	4042	3
69.741623	20.15	42.08	19.89	56.23	4163	3
69.812431	22.89	42.45	23.87	60.21	4285	4
69.884239	27.16	41.78	30.03	64.41	4489	4
69.955704	33.39	42.83	28.73	67.47	4615	4
69.994270	22.20	42.64	22.55	57.23	684	4
70.032074	38.10	41.77	28.96	70.74	3619	4
70.097137	36.84	46.59	39.93	81.17	4021	4
70.167809	31.08	45.87	39.29	75.39	4098	3
70.237717	29.87	42.12	42.55	72.96	4254	3
70.307709	21.94	39.35	39.85	66.49	4381	5
70.378113	20.68	38.18	46.50	68.95	4432	7
70.448692	21.06	39.33	50.79	74.49	4322	7
70.520195	22.48	48.90	48.59	80.88	4356	9
70.591827	23.64	51.84	48.69	83.61	4306	9
70.662560	19.81	48.02	44.77	78.96	4086	9
70.808876	26.07	49.14	38.46	78.04	3532	7
70.874329	26.42	52.19	50.50	89.46	4473	7
70.945969	36.92	50.79	56.92	99.23	4619	27
70.987038	41.80	71.81	86.84	135.74	925	27
71.024200	35.55	53.85	45.18	87.99	3434	22
71.089363	39.12	53.27	38.64	85.12	3788	22
71.158226	32.94	50.29	30.36	73.75	4090	18
71.228218	32.50	43.98	18.87	62.74	4228	18
71.298065	28.39	49.03	25.76	68.60	4354	12
71.368347	23.08	37.37	24.95	55.68	4422	12
71.439003	19.65	40.69	20.26	55.11	4348	6
71.510246	20.62	47.44	26.70	64.52	4334	22
71.582047	22.10	51.81	33.17	73.53	4325	22
71.652916	20.32	51.21	24.34	67.55	4124	7
71.722359	20.37	50.86	27.63	69.54	4104	7
71.792908	25.72	48.21	28.45	69.75	4275	5
71.864395	24.18	51.91	27.46	70.16	4450	5
71.936180	30.98	48.34	28.06	71.82	4620	9
71.985603	33.33	53.23	28.27	75.88	1742	9
72.020348	32.03	54.39	33.71	78.86	2658	12
72.077583	33.85	53.44	34.07	79.06	4021	12
72.148544	29.34	44.98	25.34	64.62	4062	22
72.218712	30.78	47.63	27.69	69.05	4199	22
72.288475	26.49	42.11	12.71	56.80	4342	27
72.368057	15.39	34.12	17.08	46.61	3204	27
72.429268	16.42	37.97	15.02	48.60	4366	32
72.499954	18.43	37.65	33.19	61.03	4240	32
72.572281	21.46	48.17	19.78	61.42	4346	27
72.643295	20.79	51.37	20.02	63.85	4153	15
72.712791	20.36	44.93	26.85	62.91	4069	15
72.783180	23.25	43.19	19.85	59.16	4256	7

72.854477	22.81	41.75	19.74	57.95	4356	7
72.926178	28.68	45.18	31.67	69.61	4575	9
72.982040	28.92	54.03	36.53	79.07	2580	9
73.017502	38.26	46.94	33.77	75.46	1841	12
73.067108	32.70	50.53	28.58	73.13	4149	12
73.138817	28.33	47.80	28.61	69.66	4041	5
73.209099	27.83	42.41	17.99	59.45	4181	5
73.278900	26.86	40.03	11.81	54.83	4337	2
73.349014	21.02	35.78	15.72	49.59	4412	2
73.419563	17.74	37.14	18.26	49.61	4371	0
73.490280	19.22	38.42	22.36	55.03	4266	0
73.562477	22.10	44.25	22.16	60.31	4363	0
73.633591	22.04	46.77	20.41	60.61	4194	0
73.703239	18.74	46.08	19.68	57.98	4016	0
73.773483	21.75	43.19	20.77	59.11	4248	6
73.844551	22.95	41.41	25.49	60.20	4287	6
73.916283	28.70	41.11	30.51	66.41	4546	6
73.975800	31.52	46.64	38.84	76.04	3078	6
74.012428	37.93	32.75	19.15	57.56	1365	7
74.057053	33.94	46.52	26.11	69.95	4206	7
74.129166	33.61	45.81	26.75	69.82	4037	6
74.199493	31.36	43.40	20.99	63.49	4159	6
74.269318	32.11	40.83	13.98	58.48	4316	4
74.339355	22.12	40.66	19.93	55.22	4394	4
74.409897	19.06	36.82	18.22	49.66	4393	6
74.480576	19.62	36.12	19.57	51.76	4272	6
74.552673	23.30	45.19	22.82	61.87	4367	4
74.621178	20.56	49.76	23.32	63.86	3685	4
74.694756	19.11	45.64	18.94	58.25	3281	5
74.763885	27.99	46.66	20.50	63.67	3817	6
74.835281	24.92	45.28	23.65	64.11	3640	6
74.906738	27.85	45.62	34.41	71.68	4482	6
74.969604	28.23	46.49	29.02	70.14	3511	6
75.005577	32.84	33.11	12.49	51.71	950	3
75.047150	25.08	47.12	27.96	67.57	4235	3
75.119476	25.69	43.65	28.79	66.12	4031	3
75.189896	26.42	43.11	25.81	63.75	4137	0
75.259758	24.06	40.56	16.16	55.34	4303	2
75.329697	19.39	38.60	18.49	52.13	4374	2
75.479271	14.29	31.16	14.84	42.03	3335	2
75.542908	22.53	41.80	18.21	56.19	4374	2
75.614204	25.40	47.35	18.45	62.56	4239	2
75.684341	20.49	45.71	16.71	57.51	3955	3
75.754120	26.36	41.87	23.32	60.86	4204	2
75.825035	24.99	42.69	22.74	61.86	4290	2
75.896736	27.74	42.76	28.21	65.60	4511	0
75.966629	29.18	41.31	23.68	63.33	4366	0
76.000717	25.31	50.10	18.95	59.46	117	0
76.037376	25.17	43.24	26.10	64.55	4270	0
76.109772	26.63	42.56	29.11	66.36	4025	0
76.180275	25.74	42.57	29.77	65.33	4126	0
76.250160	22.51	40.22	16.83	54.41	4285	0
76.320038	18.58	40.23	20.95	52.94	4349	0
76.390648	17.13	36.33	15.54	47.36	4419	2
76.461090	19.08	37.52	16.39	49.72	4304	2
76.533134	19.08	32.24	19.35	47.06	3423	2
76.613052	18.93	37.65	18.56	50.92	3340	2
76.674988	22.38	45.65	16.29	59.19	4027	3
76.744431	27.66	44.68	21.47	63.37	4173	3
76.815247	26.72	44.26	22.83	63.39	4289	3
76.887001	27.74	45.07	26.65	65.52	4495	4
76.958603	28.35	41.81	23.48	62.74	4615	4
76.996529	40.74	45.67	18.16	72.49	592	4
77.033653	25.29	42.95	25.22	63.78	3624	7
77.098915	26.32	43.51	29.12	66.79	4020	7
77.169708	25.19	43.86	29.07	65.82	4104	5
77.239632	22.08	41.13	17.23	55.77	4255	5
77.309570	18.12	42.66	20.15	54.78	4384	6
77.380020	16.83	37.09	17.73	48.99	4434	6
77.450577	19.38	34.60	15.05	46.86	4319	6
77.522118	19.93	39.64	15.32	51.45	4362	6

77.593727	26.82	45.89	17.64	62.09	4297	6
77.664375	22.66	45.79	16.05	58.77	4084	2
77.733856	27.00	47.66	25.80	66.67	4145	2
77.804535	28.38	45.63	26.33	67.03	4280	2
77.876411	27.15	44.96	30.59	67.95	4472	0
77.947960	29.19	45.55	26.34	67.56	4626	0
77.989326	46.69	51.58	30.71	86.04	960	0
78.026520	23.25	39.47	26.91	60.89	3392	0
78.089226	25.72	41.28	28.97	65.34	4019	0
78.160049	25.71	45.43	28.83	67.10	4094	2
78.230080	22.73	41.63	15.26	55.10	4232	2
78.299934	19.10	41.36	19.81	54.66	4358	2
78.370209	17.40	39.33	19.78	52.82	4417	2
78.440865	19.34	38.34	16.83	50.73	4339	6
78.512222	21.60	38.77	17.74	53.77	4345	6
78.583939	27.19	48.47	19.34	65.02	4322	6
78.654793	24.24	48.66	20.35	64.11	4117	7
78.724167	29.80	49.67	20.95	68.21	4108	7
78.794769	29.43	44.40	25.69	67.34	4279	15
78.866409	25.90	44.80	28.43	65.87	4462	15
78.938087	28.75	44.87	23.91	66.31	4611	6
78.985985	34.61	50.71	42.18	84.48	1559	6
79.020958	25.44	46.40	18.41	62.68	2831	7
79.079422	26.11	43.71	27.37	65.74	4020	7
79.150345	23.53	43.42	23.57	61.93	4069	15
79.220490	23.27	41.69	21.56	59.86	4210	15
79.290314	19.86	39.91	17.29	54.93	4345	7
79.360565	17.86	34.95	22.14	52.03	4427	7
79.431160	17.89	36.49	17.26	49.72	4351	6
79.501945	20.75	38.06	17.60	53.31	4254	7
79.574226	26.72	46.53	16.88	63.27	4346	7
79.645149	24.46	47.78	14.34	60.40	4143	6
79.714561	29.78	46.06	18.93	64.43	4088	6
79.785057	27.44	47.24	25.30	65.63	4260	6
79.856514	26.33	45.06	25.59	65.95	4389	6
79.928329	30.64	46.00	30.29	71.47	4613	4
79.982742	35.88	46.15	41.61	82.08	2400	4
80.017815	26.15	44.71	26.59	65.84	2024	4
80.068970	26.59	43.97	48.74	82.56	4149	4
80.140694	29.52	48.53	72.03	109.09	4030	2
80.210892	31.46	51.34	68.75	107.99	4190	2
80.280731	27.37	46.42	61.33	93.44	4333	5
80.350906	23.21	45.32	67.84	94.31	4417	5
80.421432	27.91	42.76	71.99	97.39	4372	15
80.492172	23.46	39.37	35.37	67.61	4260	15
80.564384	30.38	43.16	29.71	68.58	4359	12
80.635437	29.73	52.19	30.26	76.42	4183	3
80.705070	26.65	53.59	21.89	70.63	4025	3
80.775291	30.19	48.88	25.70	70.08	4245	2
80.846474	27.64	47.08	15.39	63.21	4305	2
80.918274	31.85	46.97	21.27	68.35	4561	3
80.956490	45.41	35.63	10.58	65.97	513	3
81.059723	31.18	47.78	17.35	67.12	4111	2
81.130974	27.27	45.99	18.79	64.45	4037	2
81.201271	25.55	45.69	15.11	61.17	4172	2
81.266899	24.01	47.11	15.77	61.03	3806	5
81.341484	21.22	45.03	14.83	56.90	4359	5
81.411781	23.86	39.91	22.73	55.90	4395	3
81.482452	26.24	39.71	18.37	56.94	4270	3
81.554619	30.34	48.20	22.01	68.18	4371	6
81.625778	30.28	52.10	17.34	69.72	4213	6
81.695717	24.53	53.26	13.49	65.74	3915	6
81.765640	27.59	49.74	24.97	68.26	4234	5
81.836655	26.70	47.21	13.83	62.58	4282	5
81.908417	30.79	50.40	20.89	69.07	4529	0
81.970024	33.63	57.96	19.44	77.40	3339	0
82.006607	31.60	26.48	13.50	46.29	1129	6
82.049004	31.09	47.66	18.47	67.21	4224	6
82.121307	27.22	46.48	19.48	64.90	4041	6
82.191711	26.40	45.95	24.82	66.40	4157	9
82.261559	23.19	47.19	24.50	64.96	4308	12

82.331573	20.35	45.92	21.28	60.89	4379	12
82.402061	22.65	43.70	19.05	57.91	4395	7
82.472755	26.48	48.83	26.43	67.75	4290	7
82.544708	29.11	47.03	31.20	70.70	4371	15
82.616074	31.75	56.14	20.54	75.58	4231	15
82.686157	24.21	52.63	25.24	68.66	3947	18
82.755981	23.81	53.82	28.36	71.56	4212	18
82.826942	23.61	50.72	22.32	66.15	4283	18
82.898659	29.20	45.74	22.72	68.32	4511	12
82.967110	29.77	51.41	28.84	74.24	4165	12
83.001747	34.86	56.87	29.68	73.62	295	15
83.039177	28.22	46.53	16.09	63.74	4251	15
83.111588	26.33	44.34	24.64	63.89	4033	15
83.182144	25.96	44.69	23.85	64.45	4128	18
83.252014	22.20	45.15	15.67	58.75	4284	12
83.321922	20.13	43.73	19.49	58.54	4358	12
83.392487	21.97	42.55	20.18	59.30	4419	15
83.463013	25.23	40.45	18.25	56.07	4321	15
83.534943	29.02	48.93	27.73	69.27	4380	22
83.606293	29.35	53.58	23.81	73.53	4267	22
83.676796	23.92	52.39	24.01	68.54	4035	18
83.717476	31.55	68.39	21.99	85.00	960	18
84.276932	22.42	29.42	52.96	64.62	26	5
84.312294	21.50	49.82	25.29	66.49	4346	5
84.382858	21.46	40.39	15.74	53.40	4431	15
84.453400	23.01	40.96	10.27	52.19	4312	15
84.525070	29.24	50.67	32.12	73.65	4374	22
84.596565	29.72	55.46	26.16	75.75	4292	22
84.667213	23.83	52.59	19.17	66.07	4085	18
84.736679	25.73	53.65	22.49	68.97	4155	18
84.807381	28.43	52.36	17.16	69.16	4284	5
84.879250	26.33	53.13	31.75	73.51	4480	6
84.950768	31.48	49.19	27.58	73.30	4619	6
84.991226	38.89	59.78	14.62	81.34	866	6
85.028603	27.71	44.45	28.06	68.17	3470	7
85.092072	28.79	45.75	27.58	68.69	4015	7
85.232925	24.73	45.62	15.61	61.39	4232	9
85.302780	22.67	44.89	15.93	58.93	4372	9
85.373093	21.52	41.61	17.07	55.31	4425	9
85.443718	22.55	41.07	21.12	56.92	4331	6
85.515091	25.76	42.32	24.26	60.61	4350	5
85.586815	30.04	53.53	12.26	67.61	4313	5
85.657623	24.28	55.90	17.22	68.21	4118	15
85.726990	28.68	54.12	25.13	72.68	4143	15
85.797661	26.68	54.69	18.78	68.15	4273	12
85.869202	26.27	50.65	23.17	68.49	4481	12
85.941010	30.65	44.26	22.42	67.53	4619	2
85.986595	41.69	45.61	21.03	76.15	1317	2
86.022072	25.19	44.41	21.37	61.97	3070	2
86.082329	30.59	43.75	30.62	70.09	4026	2
86.153244	28.41	47.48	24.13	67.95	4074	0
86.223320	25.62	45.29	18.33	61.84	4216	0
86.293159	23.61	46.17	19.30	62.53	4346	3
86.363426	22.32	41.21	17.51	55.64	4422	3
86.433990	23.46	42.34	15.46	55.55	4350	3
86.504883	26.72	42.08	19.30	59.66	4272	3
86.577057	28.44	51.09	19.54	66.89	4342	3
86.647995	26.27	54.64	14.86	67.92	4144	6
86.717422	26.77	52.93	24.29	69.57	4090	6
86.787941	27.75	48.77	26.75	69.47	4261	5
86.859467	26.14	51.22	22.22	66.81	4439	5
86.932106	30.64	50.53	32.30	76.21	4449	5
86.983856	32.49	43.88	15.46	64.37	2156	5
87.018623	29.44	49.02	26.48	71.74	2247	4
87.071922	31.32	44.96	21.23	66.75	4137	4
87.143555	28.32	49.37	21.27	69.18	4057	5
87.213730	27.30	45.20	28.74	68.96	4196	5
87.283531	25.11	47.75	29.64	70.06	4330	4
87.353714	21.89	41.37	14.62	54.87	4416	4
87.424248	24.21	43.59	17.10	58.29	4370	3
87.494987	27.32	41.53	25.00	61.92	4253	3

87.567268	28.99	50.45	18.25	66.06	4355	5
87.638245	24.47	48.24	19.37	63.42	4169	3
87.707893	19.56	44.88	25.61	61.01	4037	3
87.778221	20.38	45.88	24.26	60.46	4254	3
87.849503	22.26	43.26	22.48	59.52	4342	3
87.921112	27.70	45.58	29.39	68.46	4536	4
87.959053	29.26	31.97	16.81	53.77	475	4
88.062370	29.63	44.15	32.10	69.97	4134	6
88.133881	28.99	44.84	30.17	70.12	4031	6
88.204117	27.82	43.81	28.62	67.52	4183	6
88.274002	24.73	38.40	21.31	57.97	4332	5
88.344070	18.95	36.47	20.53	51.38	4404	5
88.414619	17.26	34.22	19.92	48.07	4392	5
88.485489	19.70	35.32	24.73	54.71	4188	5
88.557526	23.66	44.05	21.30	60.89	4372	3
88.628647	23.54	45.79	21.54	61.55	4214	3
88.698563	17.50	43.64	20.92	55.39	3943	3
88.768486	20.95	41.91	26.17	59.85	4235	2
88.839561	21.41	44.78	28.40	63.49	4294	2
88.911293	27.21	44.71	31.16	68.38	4534	0
88.971977	28.52	49.38	36.56	76.98	3242	0
89.008781	36.88	29.49	12.96	52.01	1230	2
89.051918	30.26	42.09	33.61	70.77	4231	2
89.124176	30.91	44.45	30.99	71.31	4032	2
89.194557	29.00	41.79	23.78	63.64	4166	2
89.264420	26.98	39.26	20.69	58.85	4315	3
89.334412	21.47	38.28	22.13	55.07	4374	3
89.404991	23.31	36.14	18.03	52.22	4403	4
89.475616	20.05	35.27	23.04	53.25	4287	4
89.547653	23.81	40.29	24.46	59.55	4378	4
89.618973	23.21	44.57	21.41	60.72	4242	4
89.688934	17.70	43.97	19.29	54.90	3920	4
89.758804	18.56	47.88	33.81	68.23	4226	27
89.829803	19.24	50.36	32.06	70.35	4285	27
89.901505	25.93	46.89	37.45	76.09	4523	32
89.968063	30.95	52.23	42.22	85.01	3945	32
90.003136	47.72	43.08	12.68	68.28	534	15
90.042038	29.81	46.24	27.75	70.29	4248	15
90.114479	30.66	45.51	28.76	70.16	4035	15
90.184975	27.84	44.05	26.23	66.41	4136	9
90.254875	28.64	39.30	18.78	57.53	4286	7
90.324738	21.79	38.13	21.16	55.04	4350	7
90.395332	20.26	34.94	19.90	49.68	4414	4
90.465904	21.21	32.99	24.70	53.18	4306	4
90.537857	23.89	40.75	25.97	61.28	4375	9
90.609177	25.74	45.09	27.18	64.54	4251	9
90.679626	19.80	44.63	22.18	57.71	4011	9
90.749199	18.56	46.05	27.64	61.99	4189	9
90.820045	22.25	50.53	33.33	74.87	4279	32
90.891762	25.67	48.95	35.90	75.69	4505	15
90.963402	34.70	43.81	24.45	67.36	4607	15
90.998947	23.33	66.38	14.16	72.33	175	15
91.034950	45.25	44.57	29.92	78.78	4031	18
91.104759	34.77	47.95	39.56	79.53	4016	18
91.175385	30.70	47.00	30.06	71.92	4120	39
91.245346	33.11	47.56	30.41	71.16	4250	39
91.315186	24.41	47.94	34.04	71.23	4365	22
91.385704	24.23	49.05	38.89	73.37	4430	22
91.456184	22.01	50.24	36.93	73.91	4334	22
91.527962	28.48	54.05	43.09	87.14	4371	32
91.599442	25.65	55.23	38.44	82.76	4296	32
91.670090	23.33	55.72	28.24	76.27	4074	12
91.739517	22.20	60.21	30.51	81.59	4175	12
91.810326	28.09	63.81	32.10	87.06	4270	18
91.882034	33.12	52.88	43.57	86.30	4486	22
91.953644	42.45	49.27	35.70	82.90	4608	22
91.992271	25.50	45.54	16.79	57.71	697	22
92.029991	45.47	49.58	33.64	83.27	3618	12
92.094986	43.22	49.99	38.29	84.77	4013	12
92.165741	38.63	51.19	28.06	76.82	4102	9
92.235764	38.61	45.93	26.71	71.36	4235	9

92.305603	33.27	42.03	19.96	63.52	4373	6
92.375984	29.97	34.01	21.49	56.84	4419	7
92.446594	25.36	35.06	22.33	55.72	4329	7
92.517998	30.34	39.92	28.84	66.78	4346	7
92.589722	27.44	47.88	20.69	65.76	4311	7
92.660507	28.79	49.23	23.57	68.52	4107	18
92.729897	37.29	55.51	31.14	84.70	4143	18
92.800545	29.36	52.64	28.29	76.04	4273	27
92.872299	28.27	45.06	29.77	69.60	4472	27
92.943855	36.38	55.59	40.64	87.18	4621	18
92.986900	43.07	60.72	44.91	94.94	1078	18
93.023216	39.60	60.05	55.02	101.27	3301	27
93.085228	38.93	60.38	55.84	102.69	4015	27
93.156090	35.90	56.26	43.77	87.38	4092	22
93.226112	35.05	48.60	34.55	75.38	4215	22
93.296028	30.34	54.50	33.72	78.69	4354	18
93.366249	22.76	38.18	32.71	61.81	4425	18
93.436867	18.44	38.88	34.24	60.57	4352	12
93.507965	36.40	67.94	90.99	132.19	4299	15
93.579941	27.25	58.18	59.71	101.19	4322	15
93.650879	22.51	56.68	23.52	70.12	4140	5
93.720230	25.33	59.97	27.50	76.30	4114	5
93.790825	28.78	56.63	26.45	76.21	4267	7
93.862305	26.29	55.61	24.60	73.75	4467	7
93.934113	31.06	57.41	50.05	92.01	4616	15
93.984932	36.85	57.33	42.89	90.25	1918	15
94.019630	28.77	57.00	32.80	83.32	2487	12
94.074905	30.97	59.17	33.15	83.61	4131	12
94.146378	28.90	53.86	29.40	76.73	4050	12
94.216583	27.79	52.90	28.35	76.21	4198	12
94.286446	26.22	46.71	22.39	66.63	4349	6
94.356598	23.12	43.20	16.70	57.80	4424	6
94.427185	22.54	49.56	25.11	67.49	4374	6
94.497894	25.51	49.15	28.58	69.78	4249	6
94.570183	27.37	57.33	22.16	73.01	4352	7
94.641159	24.41	56.84	20.28	70.17	4173	9
94.710732	22.09	58.62	20.15	69.91	4059	9
94.781044	25.98	55.47	21.69	70.32	4255	5
94.852463	24.62	51.62	26.20	69.34	4354	5
94.924133	30.48	48.85	49.24	86.28	4565	15
94.981171	29.01	64.33	37.12	88.99	2755	15
95.017029	42.29	52.87	72.85	110.25	1686	48
95.064835	29.29	65.97	48.74	94.66	4190	48
95.136780	27.46	54.77	30.61	78.02	4051	22
95.206978	27.56	47.97	23.89	68.33	4187	22
95.276840	27.17	45.48	17.72	63.45	4328	9
95.346947	22.72	45.89	18.17	60.51	4410	9
95.417488	22.44	43.80	17.01	58.29	4389	5
95.488174	26.32	44.78	20.45	61.85	4267	5
95.560417	27.71	62.70	30.84	82.34	4377	22
95.631531	25.96	60.18	23.17	76.11	4209	15
95.701363	21.43	68.67	24.28	82.67	3974	15
95.771400	27.62	74.25	27.43	93.31	4243	39
95.842476	23.64	70.06	24.46	86.25	4288	39
95.914215	28.59	62.66	31.47	83.83	4526	15
95.975067	34.96	63.43	33.52	93.58	3264	15
96.011398	34.54	54.04	45.43	84.71	1252	27
96.054817	30.09	71.65	33.86	92.74	4233	27
96.127083	28.98	59.15	22.08	76.69	4034	32
96.197479	28.90	47.17	20.10	67.22	4162	32
96.267265	28.47	46.73	17.49	65.32	4318	6
96.337257	22.79	46.13	13.93	59.62	4381	6
96.407845	21.83	42.64	19.17	58.84	4402	3
96.478516	24.81	41.24	22.37	61.34	4280	3
96.550568	28.22	51.54	27.75	71.18	4378	3
96.621864	28.50	54.79	19.77	70.38	4241	3
96.692627	19.71	52.72	15.90	62.29	3659	6
96.761665	22.09	57.01	30.98	73.70	4227	5
96.832733	23.37	51.46	23.13	66.05	4288	5
96.904396	29.74	54.42	31.03	76.63	4519	4
96.969070	32.23	48.54	23.12	71.08	3706	4

97.004517	45.05	38.22	32.42	71.06	770	6
97.044952	32.64	49.04	27.37	73.91	4246	6
97.118683	32.63	53.10	23.55	75.06	3870	6
97.187904	29.54	53.00	24.15	73.81	4146	32
97.257767	26.97	57.01	27.45	76.65	4286	12
97.327614	22.31	51.57	18.13	66.85	4365	12
97.398216	21.36	47.74	17.19	59.52	4415	9
97.468834	24.05	40.66	20.12	58.96	4306	9
97.540749	28.46	53.98	30.97	74.38	4386	18
97.612129	26.80	55.47	23.95	71.38	4249	18
97.682465	28.31	61.14	16.66	75.55	3993	111
97.752052	28.45	103.06	87.13	154.53	4197	236
97.822952	43.61	189.01	99.53	245.84	4270	236
97.894539	62.14	232.04	100.33	298.00	4456	236
97.965843	92.59	292.84	143.10	374.87	4552	236
98.035240	74.68	259.93	94.70	311.30	4127	300
98.106651	65.55	187.06	39.36	214.87	4022	300
98.177269	52.81	125.52	53.84	160.41	4122	80
98.247231	54.16	124.32	70.95	170.88	4261	80
98.317039	48.48	127.23	67.53	166.14	4341	80
98.387619	44.98	114.80	57.88	147.23	4423	27
98.458160	35.18	105.27	47.56	131.40	4310	27
98.529945	34.07	98.11	45.40	125.62	4377	27
98.601410	30.64	94.15	30.32	114.17	4277	27
98.671982	29.56	96.62	25.08	115.60	4067	32
98.741432	32.32	96.87	32.19	123.87	4177	32
98.812271	37.15	85.80	38.27	117.27	4276	22
98.884071	40.21	80.03	31.78	107.86	4497	22
98.955681	46.59	72.81	36.96	107.17	4607	22
98.994522	31.00	60.00	25.09	82.25	726	22
99.032127	45.50	66.16	32.28	98.44	3588	9
99.096909	41.20	63.53	44.78	100.70	4023	9
99.167625	36.76	57.35	44.91	93.22	4106	9
99.237617	38.23	54.52	52.91	99.73	4240	9
99.307549	31.73	56.67	51.17	95.86	4373	15
99.377960	27.70	56.05	56.26	95.75	4422	15
99.448517	22.35	53.32	50.71	87.05	4326	15
99.520042	24.93	56.68	52.67	93.51	4360	7
99.591652	24.47	63.44	46.77	94.56	4307	7
99.662422	20.40	56.92	43.86	86.32	4099	6
99.809074	30.87	51.11	42.35	85.44	3503	9
99.874313	31.08	53.28	47.62	90.97	4472	9
99.945854	39.10	53.96	48.79	94.34	4621	12
99.987244	44.20	61.13	61.32	114.28	964	12
100.024429	37.40	46.21	32.21	76.44	3399	9
100.087151	36.06	54.68	39.18	84.39	4021	9
100.158012	33.00	50.34	30.50	73.50	4092	15
100.228065	33.18	42.81	22.04	64.59	4219	15
100.297920	29.39	38.21	20.21	59.03	4358	9
100.368217	24.25	34.00	22.58	53.83	4421	9
100.438850	19.57	36.80	26.95	55.69	4350	6
100.510078	22.23	42.97	37.00	68.88	4334	18
100.581863	24.79	56.28	30.29	76.41	4316	18
100.652824	20.73	51.22	30.30	70.28	4131	15
100.722137	20.06	55.70	35.52	79.14	4126	15
100.792824	25.26	59.33	26.23	78.33	4257	22
100.864319	28.75	57.39	38.03	85.51	4457	22
100.936043	36.05	62.28	42.65	93.51	4605	22
100.985451	35.50	62.46	43.33	98.51	1736	22
101.020241	38.71	69.64	51.72	107.36	2663	22
101.078728	35.51	61.33	55.66	103.57	3890	22
101.148323	31.65	60.97	52.71	95.79	4073	27
101.218521	33.38	52.86	41.30	83.82	4205	27
101.288353	31.09	53.70	36.57	81.04	4347	22
101.358574	23.01	46.07	38.34	72.45	4425	22
101.429123	17.01	41.73	31.08	60.85	4362	18
101.499794	18.89	49.47	30.74	66.78	4240	18
101.572121	23.68	57.27	23.37	72.18	4348	15
101.643127	21.59	58.85	21.63	72.49	4160	15
101.712578	20.40	54.38	24.57	70.69	4078	15
101.783043	25.43	51.37	27.07	70.90	4260	12

101.854446	26.70	46.37	34.60	73.62	4381	12
101.926247	34.74	56.07	42.03	87.68	4602	18
101.981934	32.53	57.63	33.75	81.69	2580	18
102.017281	39.51	34.12	13.20	61.13	1858	6
102.066772	34.54	52.91	32.11	77.66	4175	6
102.138680	32.12	51.76	27.37	72.83	4065	15
102.208961	31.57	48.25	36.39	74.76	4196	15
102.278809	31.30	45.03	24.40	65.50	4345	18
102.348915	23.12	38.65	32.34	62.53	4410	18
102.419418	18.69	34.32	25.48	52.20	4384	6
102.490173	17.76	37.33	27.17	55.53	4261	6
102.562370	23.15	47.68	25.26	65.27	4366	7
102.633438	21.66	53.13	22.86	67.32	4192	6
102.703102	18.65	50.24	24.21	64.93	4009	6
102.773354	23.95	47.46	26.71	68.48	4245	9
102.844444	26.66	45.53	25.17	67.06	4298	9
102.916229	32.32	49.47	29.01	72.84	4530	5
102.975685	31.96	49.76	27.88	72.65	3085	5
103.012314	39.90	35.61	10.09	58.28	1371	9
103.056854	33.03	56.14	33.67	81.21	4227	9
103.128967	32.88	52.95	34.79	78.02	4051	12
103.199425	31.73	45.72	33.66	71.65	4172	12
103.269234	32.23	39.43	24.63	62.83	4317	9
103.339249	23.96	36.84	24.00	57.71	4390	9
103.409805	20.29	36.11	23.53	53.53	4397	2
103.480453	18.81	36.30	27.22	57.37	4282	2
103.552559	22.43	44.80	20.41	60.74	4375	4
103.623795	21.99	46.75	17.18	60.28	4222	4
103.693726	17.12	42.91	17.65	53.33	3907	6
103.763657	21.47	44.76	22.05	59.84	4232	5
103.834679	23.55	42.64	25.86	61.12	4283	5
103.906425	28.99	41.49	27.83	65.54	4523	6
103.969559	31.85	45.32	27.33	68.71	3520	6
104.005569	46.42	33.58	11.44	60.96	950	9
104.046982	34.49	52.38	33.17	78.55	4233	9
104.119308	34.27	55.00	38.60	82.71	4027	9
104.189827	31.41	44.54	31.64	68.55	4149	22
104.259712	32.04	42.53	25.04	64.79	4287	7
104.329597	23.96	37.69	29.17	60.34	4372	7
104.400177	21.16	34.54	22.91	51.90	4412	4
104.470772	19.28	35.21	24.75	54.21	4296	4
104.542778	23.34	45.11	24.74	64.42	4386	3
104.614075	23.17	49.49	20.06	63.82	4248	3
104.684303	19.19	44.22	17.71	56.04	3976	2
104.753983	21.09	45.87	22.58	60.51	4211	0
104.824944	24.40	40.05	25.08	60.85	4287	0
104.896629	28.23	47.72	29.35	70.15	4515	0
104.966461	30.81	44.24	25.75	67.89	4367	0
105.000710	22.49	62.00	22.16	69.74	117	0
105.037117	25.58	44.90	26.87	66.74	4255	0
105.109573	25.50	45.28	28.01	67.02	4023	0
105.180222	24.70	42.35	25.54	62.42	4121	2
105.250130	22.55	38.63	21.30	55.93	4266	2
105.319954	19.50	40.03	20.49	54.32	4350	2
105.390556	18.26	35.39	20.01	49.70	4422	3
105.461029	19.51	34.72	23.14	52.50	4323	3
105.532906	23.54	42.44	24.83	61.27	4372	2
105.604340	27.59	47.05	17.75	63.56	4276	2
105.674919	24.21	47.30	17.38	61.27	4062	3
105.744331	27.97	51.53	25.77	70.24	4184	3
105.815231	27.54	50.49	24.64	68.46	4268	5
105.886978	27.08	46.93	26.46	66.90	4525	2
105.958504	29.50	48.84	23.46	69.34	4616	2
105.996529	37.99	48.08	15.98	72.09	593	2
106.033821	25.60	48.48	26.96	69.68	3670	2
106.099861	25.76	45.00	29.36	68.67	4033	2
106.170616	24.75	44.15	24.11	63.88	4114	4
106.240593	21.58	40.80	19.01	56.97	4246	4
106.310425	19.37	42.75	19.44	56.78	4376	4
106.380905	18.95	38.74	20.63	53.85	4429	6
106.451469	20.21	38.85	19.72	54.02	4319	6

106.522995	23.99	43.70	24.45	62.58	4357	5
106.594627	30.32	49.37	18.84	68.02	4309	5
106.665398	27.17	50.18	16.83	65.64	4102	6
106.734711	34.41	49.36	22.09	71.86	4166	6
106.805496	33.53	55.25	23.77	78.58	4270	9
106.877235	29.13	54.53	32.97	79.21	4488	12
106.948807	28.27	58.52	38.28	86.30	4615	12
106.989853	36.80	93.70	21.59	109.35	927	12
107.026947	24.09	53.06	36.21	79.19	3435	18
107.090149	23.70	63.29	41.75	89.94	4026	18
107.160950	23.84	67.01	45.30	93.24	4094	32
107.231018	24.97	48.82	32.36	72.84	4232	32
107.300835	20.55	46.60	25.54	65.38	4358	32
107.371178	23.69	64.17	45.28	91.63	4425	32
107.441780	28.34	69.56	43.38	94.28	4343	32
107.513069	29.84	57.94	33.44	81.19	4331	32
107.584839	38.04	60.33	30.98	87.40	4322	32
107.655762	31.99	56.55	16.06	73.38	4121	12
107.725060	37.50	71.80	24.44	92.38	4134	12
107.795738	35.57	52.77	29.78	80.84	4264	9
107.867233	28.81	56.91	28.28	78.99	4480	9
107.938995	29.87	58.57	26.14	79.17	4611	7
107.986412	39.94	45.60	43.68	87.41	1510	7
108.021355	24.26	54.51	31.35	75.64	2907	15
108.080116	24.74	47.82	42.98	79.32	4064	15
108.151329	24.41	44.03	43.82	75.11	4084	15
108.221451	22.27	39.39	45.13	72.08	4207	15
108.291283	21.45	43.44	47.24	76.03	4348	27
108.361473	23.85	38.76	50.94	75.84	4427	27
108.432076	24.96	32.03	45.68	68.54	4364	12
108.502869	25.68	39.96	52.15	78.05	4249	4
108.577560	32.69	45.55	42.24	79.73	4000	4
108.646065	32.12	52.83	46.48	86.84	4161	7
108.792404	37.30	51.81	46.44	90.32	3526	5
108.857468	30.09	56.06	46.63	89.73	4404	5
108.929237	31.38	48.85	48.40	86.26	4615	7
108.983185	32.97	62.11	47.94	94.72	2341	7
109.018135	29.91	44.32	19.14	64.16	2090	5
109.069794	26.62	48.70	27.57	70.05	4169	5
109.141670	24.70	48.09	27.61	68.51	4068	9
109.211922	24.83	39.22	22.45	59.43	4201	9
109.281700	22.87	37.58	18.87	54.83	4342	4
109.351830	20.78	36.82	21.93	53.70	4418	4
109.422371	20.40	33.62	17.84	48.12	4379	2
109.493126	23.12	34.02	24.78	56.10	4260	2
109.565338	28.99	43.40	21.08	63.70	4362	3
109.636421	28.43	47.40	19.85	64.86	4186	3
109.705971	32.37	48.96	20.23	68.20	4019	3
109.776367	32.27	52.97	29.42	78.31	4247	12
109.847397	25.80	53.35	27.48	73.50	4302	12
109.919273	29.97	55.32	28.90	77.65	4546	6
109.977371	28.49	55.65	38.79	84.06	2915	6
110.013359	34.25	37.76	13.37	57.98	1486	15
110.058823	25.11	51.02	31.72	74.40	4206	15
110.130928	25.20	53.51	44.04	83.70	4056	27
110.201355	26.08	47.78	26.47	69.40	4162	27
110.271133	23.59	37.72	14.86	53.24	4318	6
110.341225	21.58	38.21	15.84	52.68	4398	6
110.411781	23.15	34.87	21.97	53.29	4396	6
110.482452	25.26	36.17	27.18	60.58	4271	6
110.554619	32.22	45.04	27.31	71.81	4375	15
110.625763	31.13	48.95	23.17	70.09	4216	15
110.695778	29.67	49.00	19.32	66.02	3901	15
110.765648	30.97	58.50	30.47	82.71	4236	6
110.836647	25.27	55.12	23.84	73.05	4284	6
110.908485	30.93	51.00	27.47	73.67	4515	6
110.969467	33.34	59.88	31.01	85.10	3282	6
111.006622	26.57	27.87	44.85	65.42	1127	15
111.048950	24.53	53.72	42.94	81.74	4236	15
111.121239	24.44	50.62	43.58	80.82	4034	15
111.191772	25.62	42.13	46.85	77.11	4155	18

111.261658	21.96	37.90	46.64	70.91	4296	18
111.331589	18.96	38.74	51.28	73.58	4378	18
111.402161	17.95	34.20	50.70	70.23	4407	7
111.472778	18.88	34.38	49.56	70.26	4294	7
111.544777	24.51	43.71	48.12	76.57	4381	15
111.616051	24.49	51.88	46.86	83.19	4246	15
111.763023	24.55	62.34	41.36	88.24	3413	9
111.826897	24.02	48.70	52.94	83.25	4280	9
111.898643	26.94	40.48	51.35	79.53	4516	6
111.967163	31.76	43.49	47.84	81.33	4178	6
112.001747	46.37	53.47	18.31	73.64	293	12
112.039085	34.11	47.47	29.06	72.80	4253	12
112.111542	33.86	46.61	32.03	73.20	4026	12
112.182175	28.81	41.60	25.18	63.26	4132	5
112.252098	29.50	39.36	21.33	58.49	4269	3
112.321930	21.22	38.15	22.60	55.33	4353	3
112.392525	17.24	35.38	27.75	52.59	4422	22
112.463013	17.71	32.61	26.49	52.01	4316	22
112.534943	22.63	41.82	24.24	60.11	4376	12
112.606316	23.81	47.33	16.83	60.32	4276	12
112.676888	19.05	42.25	15.27	53.00	4051	12
112.746323	19.28	39.96	20.66	53.90	4198	12
112.817207	21.88	41.83	21.93	57.59	4266	6
112.888969	23.11	46.01	28.66	64.92	4528	5
112.960602	30.35	49.51	23.80	68.72	4633	5
112.997559	25.66	35.15	12.88	51.00	414	5
113.034111	31.82	45.31	42.55	78.56	3806	4
113.101814	32.79	46.38	44.86	80.82	4026	4
113.172585	28.81	43.86	43.05	74.34	4111	6
113.242546	28.33	40.28	44.49	72.32	4250	6
113.312340	21.43	35.21	44.95	67.30	4354	7
113.382904	18.52	30.58	49.17	67.17	4429	7
113.453461	18.06	30.71	46.86	64.56	4307	7
113.525116	22.32	37.66	49.73	72.89	4376	6
113.676102	17.68	41.09	44.64	69.40	3177	3
113.736633	19.56	44.17	53.47	79.39	4169	3
113.807434	19.40	45.18	50.59	78.41	4270	4
113.879295	22.65	46.81	52.67	82.22	4501	4
113.950775	27.28	48.28	46.99	80.12	4617	4
113.991272	27.50	59.66	79.39	109.13	865	4
114.028526	30.49	42.15	25.98	66.05	3468	4
114.092133	29.25	42.67	27.31	66.90	4028	4
114.162941	26.60	42.90	25.24	63.87	4103	3
114.232941	26.40	39.03	20.04	57.10	4234	3
114.302834	19.84	41.97	21.68	57.49	4373	9
114.373161	15.96	34.44	22.38	49.26	4425	9
114.443764	17.35	31.03	21.78	47.52	4333	7
114.515137	20.01	36.02	25.98	55.24	4345	5
114.586876	23.12	45.26	17.92	59.29	4321	5
114.657745	19.69	44.63	18.71	56.99	4127	7
114.727013	19.65	42.47	27.21	60.55	4140	7
114.797745	22.72	42.54	27.56	61.00	4269	5
114.869240	23.90	45.01	23.32	62.51	4512	5
114.941032	26.71	44.50	23.78	64.39	4623	7
114.986710	32.09	44.54	27.05	71.80	1325	7
115.022079	27.13	40.58	16.20	58.55	3069	6
115.082153	28.22	43.38	23.57	65.03	4058	6
115.153297	26.28	44.74	22.64	63.98	4087	18
115.223389	22.90	47.57	34.82	71.32	4210	18
115.293251	19.92	41.50	27.18	60.36	4356	27
115.363472	15.56	33.14	24.44	49.10	4427	27
115.434067	14.60	39.16	27.13	56.14	4356	27
115.505173	19.21	54.01	40.61	80.55	4186	56
115.577164	26.64	74.49	34.20	96.84	4338	56
115.648087	21.13	57.72	17.66	71.42	4150	15
115.717422	23.49	54.43	24.66	71.89	4102	15
115.788010	27.24	50.87	27.47	73.70	4272	7
115.859467	24.56	51.81	24.27	71.32	4441	7
115.931259	29.51	58.35	28.84	79.17	4610	9
115.983932	30.26	65.18	32.04	88.12	2165	9
116.018654	28.71	51.28	36.00	78.94	2272	6

116.071785	26.16	52.16	42.82	81.59	4178	6
116.143623	23.91	48.16	42.14	77.74	4067	2
116.213829	24.38	40.18	42.56	72.60	4195	2
116.283707	23.06	36.99	47.59	72.45	4347	3
116.424385	17.75	35.67	48.03	68.92	4377	9
116.495102	21.76	39.03	46.01	71.95	4256	9
116.567375	26.93	48.67	45.32	79.27	4354	6
116.638382	25.01	50.02	48.33	82.24	4178	6
116.707939	29.89	49.20	49.64	85.87	4043	6
116.778313	30.02	53.44	47.07	88.86	4259	7
116.849487	25.23	48.37	45.71	82.04	4348	7
116.921379	29.38	51.21	46.71	85.97	4578	4
116.979515	29.16	51.93	43.75	83.91	2928	4
117.015938	34.23	40.33	14.93	58.12	1524	0
117.061836	25.83	47.30	33.83	72.54	4211	0
117.133995	24.42	44.62	26.00	65.87	4051	0
117.204338	25.10	40.03	22.72	60.82	4177	0
117.274109	22.72	39.79	18.80	56.69	4330	4
117.344177	19.88	41.34	17.66	55.56	4402	4
117.414734	19.77	37.51	20.13	52.75	4394	3
117.485428	23.64	38.21	21.46	56.87	4265	3
117.557594	28.04	45.68	14.75	61.99	4377	3
117.628777	28.19	48.63	18.13	66.05	4206	0
117.698708	28.55	50.52	18.00	66.68	3918	0
117.768608	29.89	50.07	29.11	75.48	4247	3
117.839592	25.75	51.08	26.36	72.09	4289	3
117.911423	30.15	48.29	27.76	72.84	4519	3
117.971901	32.00	62.33	35.29	88.69	3213	3
118.008751	21.75	19.59	12.68	34.58	1233	15
118.051941	24.46	52.25	27.95	73.61	4226	15
118.124290	25.18	46.37	24.64	67.19	4037	15
118.194778	25.62	41.76	21.18	62.48	4158	6
118.264595	22.00	41.96	16.22	58.03	4302	7
118.334526	21.06	44.58	20.60	60.32	4384	7
118.405106	21.90	50.58	24.57	66.12	4399	12
118.475754	23.39	46.98	22.72	65.62	4288	12
118.547745	30.44	52.48	25.46	75.48	4376	9
118.619087	33.23	60.86	28.96	85.16	4240	9
118.689133	31.74	59.71	13.45	74.72	3940	15
118.758888	38.20	56.41	20.88	80.37	4226	12
118.829872	22.03	54.32	18.19	67.17	4287	12
118.901657	26.49	46.75	32.21	70.45	4515	27
118.968285	29.85	53.20	40.25	82.46	3951	27
119.003136	45.60	56.95	49.88	92.96	534	39
119.042168	26.47	59.54	48.06	93.81	4247	39
119.114616	28.34	50.82	48.04	84.57	4036	39
119.185165	26.86	47.17	47.30	81.45	4135	18
119.255066	26.21	37.78	46.68	73.31	4278	15
119.324898	18.72	36.93	45.37	68.08	4361	15
119.395485	15.50	38.33	50.86	76.68	4416	9
119.466003	17.70	37.87	43.75	68.43	4310	9
119.537941	21.64	42.84	45.27	73.22	4380	7
119.688263	14.76	43.43	37.10	67.40	3173	7
119.749245	22.21	53.32	45.28	83.63	4210	7
119.820129	22.67	46.32	43.83	77.44	4280	9
119.891884	26.01	46.69	52.50	86.87	4509	9
119.963493	29.85	49.09	43.72	83.37	4621	9
119.998955	18.61	71.64	31.86	84.28	176	9
120.034431	30.25	45.50	28.22	70.02	3921	12
120.103821	29.82	44.76	39.42	75.55	4028	12
120.174500	25.74	44.30	30.86	66.90	4111	12
120.244514	26.42	37.39	18.16	54.43	4249	12
120.314293	19.49	38.43	17.00	51.48	4336	6
120.384911	16.13	33.97	20.16	47.17	4429	9
120.535904	16.65	36.31	30.61	54.03	3384	15
120.590640	22.81	48.38	20.40	61.87	4292	15
120.669296	17.37	45.47	16.95	54.58	4080	12
120.738647	21.82	53.43	28.20	70.44	4180	12
120.809456	23.45	52.72	30.79	71.72	4284	12
120.881332	24.50	43.65	26.60	63.40	4503	22
120.952858	28.11	55.06	33.10	79.53	4624	22

120.991722	20.72	49.37	28.00	67.37	721	22
121.029350	28.65	51.00	27.28	73.36	3608	15
121.094116	25.48	47.82	38.54	76.12	4016	15
121.164940	23.86	47.94	32.81	70.51	4100	32
121.234955	26.17	40.02	23.25	60.68	4236	32
121.304848	21.05	38.84	19.45	54.41	4377	5
121.375183	16.35	35.81	22.32	49.96	4426	4
121.445801	15.79	35.85	16.78	47.25	4334	4
121.517166	19.59	39.21	22.76	54.77	4348	7
121.588921	22.73	47.59	16.52	60.40	4317	7
121.659744	20.20	47.55	21.71	62.40	4117	9
121.728996	24.50	50.97	29.28	70.50	4164	9
121.799744	26.25	49.53	26.66	68.67	4274	15
121.871284	25.45	47.38	28.24	67.72	4514	15
121.943100	28.59	43.01	21.55	63.92	4626	6
121.986816	39.80	46.53	28.43	77.83	1144	6
122.022835	25.38	41.57	21.86	61.43	3238	6
122.084259	25.84	46.28	29.91	69.12	4050	6
122.155289	24.77	49.63	37.62	75.47	4093	22
122.225380	24.81	39.91	25.63	61.39	4215	22
122.295235	21.72	40.34	22.14	57.20	4355	12
122.365402	16.72	34.58	19.73	47.65	4416	12
122.436287	16.44	36.64	16.81	48.07	3670	15
122.507607	24.30	43.18	28.82	64.07	3509	15
122.579132	21.67	53.33	17.49	64.79	4337	15
122.650070	18.20	56.18	16.70	65.19	4143	18
122.719353	19.58	52.66	23.51	66.52	4107	18
122.790024	22.53	50.54	33.55	71.80	4268	18
122.861504	27.63	55.36	28.50	74.21	4460	18
122.933205	34.08	61.46	24.19	81.89	4595	15
122.984627	36.27	58.28	30.31	82.31	1985	15
123.019257	33.37	65.30	52.32	102.23	2442	18
123.073845	38.38	53.39	37.90	84.80	4160	18
123.145599	35.21	45.04	42.96	79.74	4072	7
123.285637	31.39	37.47	45.97	74.55	4342	7
123.355835	22.75	31.90	45.63	67.49	4425	7
123.426376	19.08	42.41	43.22	72.35	4379	32
123.497093	17.74	44.73	50.28	77.85	4257	32
123.569344	22.78	52.01	47.44	82.53	4349	39
123.640381	18.92	51.30	47.08	79.98	4169	22
123.709862	20.42	54.58	54.66	89.95	4061	22
123.780327	23.91	53.87	52.88	87.96	4255	18
123.851601	26.12	52.26	51.46	88.55	4375	18
123.923462	34.08	59.28	53.68	101.89	4594	22
123.980789	32.07	52.72	52.77	92.08	2825	22
124.016815	45.97	36.86	11.19	63.47	1625	9
124.063866	34.55	42.75	27.86	69.98	4206	9
124.135971	32.30	45.77	26.03	69.07	4055	9
124.206329	29.85	44.94	26.71	65.76	4177	9
124.276131	29.19	41.11	23.28	60.72	4335	12
124.346169	21.04	34.37	19.07	49.37	4403	12
124.416710	17.99	32.93	20.89	46.73	4390	5
124.487381	20.97	34.29	25.92	55.15	4253	5
124.559608	23.42	44.15	19.60	59.00	4380	7
124.630737	23.41	47.22	20.13	61.34	4201	27
124.700600	18.26	45.91	18.51	56.38	3952	27
124.770599	22.40	57.11	31.77	79.37	4240	48
124.841599	22.49	57.44	36.05	81.41	4298	48
124.913429	30.95	54.30	34.13	80.83	4519	22
124.974167	34.85	53.27	38.31	85.83	3241	22
125.010811	36.55	29.04	15.01	52.52	1237	5
125.053970	31.01	51.02	30.83	75.44	4226	5
125.126282	32.31	44.65	27.17	68.92	4042	5
125.196747	29.22	38.99	22.50	60.00	4163	5
125.266548	28.83	38.51	20.52	57.95	4310	6
125.336563	21.55	37.77	21.21	53.69	4383	6
125.407104	19.08	35.24	21.01	49.54	4398	9
125.477753	19.51	33.67	29.87	55.61	4285	9
125.549767	23.38	47.72	27.80	65.33	4373	6
125.621086	22.47	48.65	25.61	64.12	4233	6
125.690994	16.55	44.83	17.20	54.29	3924	6

125.760963	18.41	44.71	22.14	58.03	4226	7
125.831902	23.42	42.24	25.28	60.19	4289	7
125.903702	32.16	43.82	36.49	72.35	4522	7
125.968864	35.17	45.11	33.29	73.26	3763	7
126.004181	52.82	36.76	18.52	70.09	711	7
126.044174	37.30	47.67	27.98	73.80	4234	7
126.116623	40.14	45.92	26.82	73.73	4031	7
126.187157	33.74	42.65	30.75	69.14	4141	7
126.257057	35.27	45.40	32.74	73.63	4279	18
126.326889	25.58	35.28	22.90	55.92	4358	18
126.397476	22.75	36.14	21.84	51.55	4410	7
126.468010	21.77	37.00	33.84	60.37	4304	7
126.539963	25.86	43.12	32.92	67.13	4385	12
126.611351	23.76	46.31	28.80	65.46	4271	12
126.681763	20.20	43.31	16.38	54.70	4020	5
126.751228	18.64	46.73	28.15	62.19	4216	7
126.822197	23.20	47.22	22.47	62.86	4289	7
126.893936	30.34	39.02	29.16	64.44	4515	15
126.965530	38.02	42.57	25.20	68.49	4614	15
127.035393	38.36	51.58	39.91	84.50	4146	18
127.106911	40.23	48.49	44.71	86.50	4024	18
127.177559	31.74	49.67	45.84	82.61	4114	18
127.247475	34.32	40.55	27.00	64.87	4263	18
127.317268	26.37	36.38	21.94	56.04	4346	6
127.387856	22.45	34.70	25.45	53.85	4418	6
127.458366	22.78	33.11	22.58	51.85	4326	6
127.530182	24.40	40.82	29.79	61.53	4377	9
127.601624	24.21	48.78	25.82	65.36	4287	9
127.672295	20.70	44.27	15.16	55.74	4075	7
127.741646	18.19	45.48	22.50	58.06	4176	7
127.812454	22.08	41.13	23.91	58.74	4283	6
127.884331	27.01	41.60	27.00	62.69	4503	15
127.955788	34.46	42.87	31.41	69.60	4624	15
127.994209	19.92	41.39	30.68	58.75	674	15
128.031418	38.75	50.49	40.05	84.65	3554	7
128.096130	35.38	43.53	34.95	74.48	4017	7
128.166916	29.43	44.28	31.85	68.77	4102	7
128.236938	31.05	40.17	24.10	62.04	4242	7
128.306839	25.69	37.99	20.42	55.98	4377	6
128.377213	19.24	33.24	20.79	48.04	4435	4
128.447815	19.59	33.28	21.48	49.62	4326	4
128.519287	23.76	37.21	26.56	58.02	4358	4
128.590927	22.23	44.53	18.56	57.50	4304	4
128.661728	19.06	42.98	18.28	54.77	4106	2
128.730972	17.02	41.07	29.37	59.13	4155	2
128.801773	17.35	45.36	32.18	64.91	4277	6
128.874680	20.16	42.12	27.27	59.99	4255	6
128.945160	28.64	50.59	28.66	73.31	4621	4
128.986618	33.71	47.64	26.35	72.44	975	4
129.023666	32.37	39.60	26.13	66.05	3407	3
129.086304	31.41	40.67	27.08	67.57	4040	3
129.157288	30.50	42.88	27.17	66.58	4098	0
129.227386	28.44	41.67	17.77	59.46	4225	0
129.297226	22.74	43.28	19.67	58.43	4357	3
129.367447	17.99	38.88	18.35	51.27	4421	3
129.438156	18.83	35.85	18.79	49.41	4351	3
129.509262	21.05	37.31	21.36	52.98	4321	4
129.581161	21.97	44.76	17.58	57.22	4326	4
129.652161	22.13	45.12	16.91	57.41	4139	4
129.721420	20.47	42.39	23.48	57.81	4126	4
129.792053	19.70	44.07	26.95	60.17	4275	6
129.863602	20.65	42.18	24.34	58.48	4474	6
129.935303	26.40	43.35	25.96	63.01	4599	7
129.985260	29.21	39.26	42.50	74.08	1807	7
130.019913	28.96	42.59	16.15	60.90	2604	5
130.075883	38.35	45.38	31.41	70.86	4160	5
130.147629	25.15	45.17	28.29	66.63	4079	9
130.217834	24.63	40.07	23.21	58.93	4206	9
130.287643	20.89	40.43	17.52	54.71	4344	4
130.357864	14.60	37.18	19.44	48.65	4428	4
130.428421	15.34	34.33	19.16	47.17	4366	6

130.499130	17.89	34.97	23.24	50.84	4238	6
130.571442	20.89	46.82	21.68	61.35	4349	6
130.642395	20.87	46.06	19.36	57.89	4164	12
130.711823	22.14	48.37	26.07	66.10	4074	12
130.782333	21.80	53.71	32.97	74.89	4262	12
130.853745	18.09	50.95	25.47	65.33	4399	12
130.925568	24.03	49.64	33.46	74.38	4603	9
130.981644	22.50	55.26	34.35	78.83	2646	9
131.017120	34.27	43.85	27.67	69.71	1805	12
131.065918	24.86	54.61	33.41	78.25	4205	12
131.138016	24.31	47.83	37.28	73.23	4057	9
131.208374	23.64	40.92	24.49	58.81	4183	9
131.278122	22.66	38.22	17.21	54.22	4340	4
131.348236	15.63	36.35	19.29	48.90	4408	4
131.418747	14.35	34.18	18.52	46.02	4383	3
131.489471	17.17	34.35	24.08	50.95	4266	3
131.561661	23.03	46.45	18.13	60.03	4372	5
131.632736	21.52	47.63	20.41	60.69	4189	4
131.702454	20.87	46.85	18.81	59.47	3993	4
131.772644	25.69	43.88	23.05	62.85	4250	4
131.843674	22.14	41.11	22.85	59.90	4299	4
131.915527	24.48	45.78	22.92	63.67	4524	5
131.975525	26.07	54.96	32.03	76.87	3160	5
132.012085	30.49	28.65	40.81	64.72	1321	5
132.056091	24.16	51.88	38.91	77.28	4223	5
132.128311	22.95	45.91	43.24	74.47	4040	5
132.198792	23.19	39.91	40.23	66.75	4156	5
132.268539	21.97	38.75	44.75	69.61	4322	5
132.338577	16.04	34.40	42.97	62.11	4388	5
132.409103	14.95	32.31	48.50	64.59	4398	2
132.560486	17.06	40.85	37.33	64.90	3399	5
132.623093	22.66	47.05	47.66	77.81	4224	5
132.693039	19.08	45.34	51.12	77.24	3921	2
132.763000	24.12	48.77	49.76	82.07	4229	3
132.833954	22.80	46.70	43.85	76.13	4283	3
132.905746	26.31	41.45	44.51	75.62	4523	7
132.969345	27.92	48.83	42.35	80.50	3579	7
133.005203	46.16	26.65	12.87	56.69	891	7
133.046249	29.81	48.12	26.91	71.02	4244	7
133.118652	30.20	46.18	32.43	72.19	4038	7
133.189163	27.10	47.96	42.95	77.64	4146	18
133.259048	30.63	44.42	33.98	71.49	4288	27
133.328934	21.56	37.83	26.51	58.25	4372	27
133.399521	16.95	39.37	30.17	58.58	4414	15
133.470016	17.26	38.13	26.71	54.39	4304	15
133.542053	20.42	46.84	25.27	61.95	4383	7
133.613373	20.51	49.10	17.96	60.36	4245	7
133.683746	16.46	44.16	17.81	53.36	4011	4
133.753311	18.35	41.00	23.90	55.30	4212	12
133.824310	17.52	54.96	28.44	69.45	4281	12
133.896027	21.79	48.01	35.10	71.61	4514	27
133.966232	27.44	54.65	30.68	76.80	4414	27
134.000366	36.28	69.65	27.19	83.17	57	27
134.036407	26.79	55.71	38.84	83.76	4261	27
134.179581	25.60	42.12	25.47	61.58	4125	7
134.249649	28.92	44.09	16.88	61.67	4244	7
134.319275	22.46	36.51	15.34	50.37	4351	7
134.389877	19.75	29.65	17.84	44.13	4427	9
134.460388	19.45	31.71	18.81	46.55	4321	9
134.532242	21.56	39.85	21.47	55.47	4372	18
134.603699	24.87	48.12	16.99	61.35	4274	18
134.674332	29.84	53.48	15.47	68.38	4077	22
134.743652	18.09	43.26	33.26	63.90	4193	22
134.815735	17.37	49.96	30.91	67.71	4081	15
134.886383	19.28	45.54	30.61	64.76	4505	7
134.957855	26.28	45.19	26.74	67.37	4617	7
134.996185	18.87	42.38	14.30	54.78	650	7
135.033707	30.20	43.12	24.85	66.37	3600	22
135.099167	30.94	47.01	32.44	74.02	4018	22
135.169983	25.18	43.09	25.66	62.87	4106	9
135.239914	25.47	38.05	20.60	55.93	4243	9

135.309814	19.02	36.78	18.18	50.23	4378	5
135.380203	15.88	32.88	21.42	47.35	4440	5
135.450806	17.54	34.16	22.92	50.27	4318	5
135.522324	20.03	39.56	25.19	56.74	4363	6
135.593964	21.53	43.12	19.22	56.20	4310	6
135.664780	20.31	45.97	21.01	58.41	4109	5
135.733994	17.06	42.82	28.29	60.85	4167	5
135.804810	19.69	48.32	31.83	67.93	4277	12
135.876480	24.69	46.98	42.32	75.80	4508	6
135.948120	41.86	48.74	63.04	99.73	4624	6
135.989166	40.55	37.07	100.78	123.65	925	6
136.026245	59.05	64.29	73.42	126.75	3445	32
136.089386	63.37	64.16	70.44	128.85	4023	32
136.160339	53.28	61.74	69.90	121.03	4098	12
136.230392	48.63	55.27	65.57	113.22	4227	12
136.300201	46.36	50.82	68.84	111.40	4360	9
136.369995	39.65	47.42	68.51	105.89	4368	9
136.443420	55.86	49.98	67.43	112.44	3388	12
136.512390	63.11	63.04	81.43	133.97	4333	7
136.584213	59.71	70.46	90.93	142.78	4322	7
136.655212	66.31	72.21	92.07	146.10	4134	9
136.724426	54.30	62.44	92.09	133.80	4140	9
136.795044	27.31	50.51	49.87	86.71	4282	6
136.866592	25.28	45.01	61.15	87.04	4486	6
136.938324	30.87	54.50	55.62	92.34	4615	9
136.986267	22.86	34.46	55.31	73.13	1570	9
137.020676	43.70	50.88	45.61	88.40	2782	12
137.078049	36.97	51.53	24.78	78.19	4144	12
137.149658	35.31	56.66	28.37	81.20	4085	32
137.219818	33.85	46.80	16.65	67.92	4205	32
137.289642	33.49	40.30	19.15	62.61	4339	15
137.359894	25.80	40.08	33.25	65.20	4426	15
137.430496	26.69	34.99	29.81	60.97	4363	15
137.501022	24.52	36.28	21.77	54.78	4218	12
137.573715	29.14	46.86	27.11	68.61	4325	12
137.644424	20.72	43.26	24.54	60.09	4161	12
137.714859	17.10	43.80	17.82	53.41	3826	12
137.784454	17.18	50.59	25.09	64.75	4246	15
137.855850	18.25	52.32	26.79	67.90	4405	15
137.927597	23.86	47.99	32.31	71.17	4612	15
137.982452	24.75	53.55	44.94	81.93	2467	15
138.017517	33.71	41.91	25.12	65.84	1978	80
138.068008	28.05	77.74	68.67	122.06	4202	80
138.140030	33.63	91.66	70.92	133.39	4057	80
138.210342	34.64	75.80	53.30	110.23	4189	80
138.280121	31.88	53.49	30.76	77.70	4335	18
138.350281	20.92	46.64	27.38	64.72	4398	18
138.420761	17.51	46.13	22.33	60.52	4379	9
138.491501	19.07	46.66	27.92	64.00	4262	9
138.563721	22.60	54.02	19.12	66.83	4364	6
138.634766	20.69	53.46	19.49	65.75	4184	4
138.704391	20.14	53.69	18.95	65.48	4021	4
138.774704	20.43	51.55	24.44	67.86	4252	12
138.845825	20.20	56.83	28.10	74.38	4310	12
138.917648	24.89	56.25	30.02	76.93	4539	15
138.976151	23.59	62.16	40.41	87.83	2977	15
139.012589	40.74	42.31	14.51	64.69	1502	18
139.058167	29.66	47.81	27.57	70.24	4217	18
139.130402	30.15	47.84	29.65	70.54	4043	9
139.200775	28.20	40.28	22.99	60.23	4172	9
139.270554	28.10	43.48	20.63	61.10	4325	6
139.340607	21.82	37.59	21.05	53.97	4388	6
139.411148	16.77	36.64	20.00	50.28	4392	6
139.481750	18.96	35.93	25.96	54.27	4290	6
139.553940	21.76	45.29	19.38	59.59	4376	4
139.625153	22.44	49.02	16.33	60.19	4214	3
139.695053	16.19	46.38	19.09	56.09	3912	3
139.765045	20.64	47.08	29.14	66.03	4232	3
139.838425	19.83	41.45	19.01	54.08	3691	3
139.907837	26.51	50.38	28.24	70.28	4517	5
139.969849	32.64	59.42	27.39	81.79	3399	5

140.006256	45.13	29.90	13.67	58.42	1070	7
140.048294	35.41	52.18	35.04	81.57	4239	7
140.120697	38.44	44.84	26.26	71.31	4033	7
140.191193	33.73	42.07	22.62	65.21	4148	7
140.261063	33.60	38.76	18.86	60.39	4299	7
140.330978	25.11	37.79	18.83	54.51	4363	7
140.401535	22.77	31.09	19.07	48.66	4408	9
140.472092	23.05	32.74	23.74	52.76	4305	9
140.538223	18.64	43.95	21.31	58.23	3677	9
140.624161	24.98	47.83	17.27	62.03	3305	9
140.685699	20.53	43.59	15.50	53.89	3992	6
140.755341	19.99	43.17	23.50	58.86	4214	5
140.826340	22.08	41.41	24.85	59.46	4285	5
140.898071	28.72	42.21	29.46	66.19	4515	5
140.967041	38.03	42.04	21.58	66.34	4240	5
141.001404	50.39	55.10	25.14	79.10	235	4
141.038437	38.01	47.83	31.87	76.91	4256	4
141.110992	44.87	45.94	33.18	79.61	4030	4
141.181625	41.49	46.42	42.71	83.79	4126	3
141.251511	42.20	42.49	32.03	75.41	4270	4
141.321350	35.30	38.22	31.35	66.99	4357	4
141.391907	29.12	32.97	24.40	56.00	4426	3
141.462402	21.47	32.83	25.13	53.11	4323	3
141.534302	24.23	43.14	23.52	60.52	4371	4
141.605713	23.16	47.10	18.72	59.89	4278	4
141.676331	18.95	43.44	20.31	55.47	4068	4
141.745697	15.51	42.38	28.00	58.32	4205	4
141.816605	17.96	52.13	25.86	66.92	4277	9
141.888412	22.03	50.81	30.25	68.79	4518	5
141.959900	28.88	45.97	27.55	66.79	4609	5
141.997208	18.51	34.77	13.67	45.87	473	5
142.034012	32.20	53.71	34.32	80.81	3724	6
142.101257	34.43	43.46	31.81	72.74	4020	6
142.171951	27.12	45.73	27.05	66.20	4107	7
142.241989	28.00	38.51	26.67	59.63	4245	7
142.311859	24.10	36.82	15.56	51.90	4379	6
142.382217	18.90	30.35	14.11	42.60	4437	4
142.452850	15.61	31.83	13.45	41.66	4312	4
142.524414	22.09	37.40	21.16	53.66	4360	4
142.596024	21.79	44.79	16.69	56.36	4308	4
142.666824	18.15	42.96	15.53	52.96	4101	5
142.736069	18.57	48.15	25.59	62.19	4176	5
142.806870	17.19	49.83	29.29	66.06	4278	4
142.878708	21.52	50.29	35.97	72.70	4492	7
142.950226	25.21	52.84	32.27	73.78	4634	7
142.991287	21.75	44.39	54.97	83.75	930	7
143.028336	32.20	42.66	32.39	69.91	3424	5
143.091522	28.98	44.83	41.98	76.92	4018	5
143.162399	24.94	44.37	40.27	71.65	4104	9
143.232422	24.82	36.95	52.23	74.63	4231	9
143.302231	20.57	34.80	75.57	92.75	4362	7
143.372528	14.91	33.23	77.34	90.41	4426	7
143.443207	18.81	31.99	79.86	92.12	4344	12
143.514511	22.25	38.02	75.33	93.99	4349	7
143.586258	28.24	49.00	91.90	116.37	4319	7
143.657242	22.36	44.62	82.48	105.03	4131	5
143.803360	29.07	64.75	74.98	116.50	3542	9
143.868683	24.31	47.76	61.06	88.86	4494	9
143.940384	28.31	46.99	73.18	98.77	4620	7
143.986710	21.90	43.15	62.29	84.75	1391	7
144.021881	36.92	49.02	49.73	87.30	3011	6
144.081223	33.99	48.78	42.95	82.46	4114	6
144.152756	30.03	48.45	46.09	81.39	4091	9
144.222870	26.83	44.26	46.56	76.23	4210	9
144.292633	25.88	39.81	57.43	81.94	4340	9
144.362900	19.47	34.46	61.88	79.97	4420	9
144.433533	20.96	34.81	55.85	74.43	4366	6
144.504333	24.16	38.10	52.40	75.39	4252	7
144.576553	27.37	45.87	56.16	83.09	4351	7
144.647507	25.42	44.79	47.09	75.33	4156	18
144.793777	28.23	65.39	80.16	114.69	3528	111

144.858948	24.72	50.49	50.62	83.43	4410	111
144.930573	31.70	54.14	69.33	104.57	4623	67
144.983734	30.27	73.79	78.85	127.64	2225	67
145.018066	49.15	82.51	89.83	143.66	2157	207
145.070145	32.07	73.42	55.31	108.66	4186	207
145.142075	36.20	140.72	122.29	210.18	4051	179
145.212402	37.55	106.24	56.18	132.93	4183	179
145.282135	33.36	92.48	63.93	126.58	4336	80
145.352310	29.23	105.21	60.66	138.80	4411	80
145.422836	22.58	90.16	51.60	116.00	4378	67
145.493515	21.35	86.01	87.85	138.26	4260	67
145.565781	27.37	71.90	54.63	110.25	4360	48
145.636826	27.94	65.39	25.68	83.23	4179	48
145.706375	27.29	74.63	20.49	91.93	4034	48
145.776733	33.69	83.87	32.22	106.39	4249	80
145.848007	28.42	70.75	24.62	89.03	4339	80
145.919739	31.71	67.80	29.23	89.05	4547	32
145.978256	30.06	70.27	19.22	85.65	2975	32
146.014694	55.77	58.89	51.75	103.33	1496	39
146.060272	32.72	79.18	33.54	99.79	4212	39
146.124817	26.37	64.92	28.11	85.03	3189	39
146.202820	28.72	55.11	25.05	77.81	4172	39
146.272614	31.12	59.01	26.50	81.64	4328	27
146.342667	24.59	58.95	34.83	82.26	4394	27
146.413223	20.06	56.27	22.70	71.70	4394	27
146.483841	21.31	50.99	23.29	66.58	4294	27
146.556046	28.88	57.88	24.53	76.42	4374	15
146.627167	26.97	55.23	26.36	74.53	4204	22
146.697159	24.05	54.09	29.31	75.33	3915	22
146.767136	29.46	60.49	31.53	82.52	4232	27
146.838135	28.07	56.60	22.96	74.79	4295	27
146.909897	31.25	55.63	29.37	80.46	4519	27
146.970825	39.53	68.96	50.56	108.38	3278	27
147.007538	39.09	39.74	7.37	58.90	1208	15
147.050415	31.29	65.35	28.87	87.35	4241	15
147.122757	28.82	55.76	27.68	76.82	4047	15
147.193268	27.26	48.31	27.35	69.77	4152	18
147.260468	27.36	43.21	21.00	61.87	3951	18
147.333038	27.77	43.72	22.73	63.35	4375	18
147.403580	26.37	45.91	29.90	66.84	4404	18
147.474152	24.41	41.33	23.29	60.29	4302	18
147.546188	27.01	48.55	29.28	69.46	4374	9
147.617493	27.00	51.06	26.15	70.45	4243	9
147.687576	27.78	47.58	18.84	64.74	3955	22
147.757416	26.61	45.98	19.76	64.14	4223	18
147.828339	27.08	44.45	14.02	59.76	4288	18
147.900116	31.31	43.44	20.10	65.20	4517	2
147.967651	35.56	43.42	29.17	70.20	4057	2
148.002426	64.51	46.70	26.53	85.98	413	7
148.040527	40.93	47.83	21.01	73.34	4260	7
148.113037	41.99	47.42	17.24	72.13	4025	7
148.183640	33.79	44.38	19.85	64.61	4131	6
148.253540	36.44	39.50	19.64	61.95	4270	5
148.323364	28.18	39.83	16.26	57.32	4359	5
148.393936	24.05	36.78	22.87	54.81	4426	6
148.464447	24.75	38.55	20.81	56.63	4326	6
148.536392	26.60	42.94	26.85	63.05	4373	9
148.607742	27.56	46.97	18.97	63.91	4263	9
148.678375	27.94	43.27	19.81	60.28	4057	12
148.747726	26.59	41.95	26.76	64.11	4209	12
148.818665	27.65	45.60	14.12	59.66	4278	9
148.890411	32.26	48.38	33.45	76.25	4514	12
148.962006	40.11	47.26	26.26	73.60	4606	12
148.998245	24.19	63.70	24.85	73.47	296	12
149.034348	38.86	45.02	19.37	69.84	3870	5
149.103333	39.72	48.74	21.22	74.47	4016	5
149.174072	30.27	46.06	19.31	65.17	4111	6
149.243988	34.59	42.05	20.45	64.05	4253	6
149.313858	27.61	39.69	15.80	56.97	4378	7
149.384262	23.15	34.27	19.24	52.33	4433	9
149.454819	22.75	36.44	21.65	54.10	4337	9

149.526535	26.79	40.74	28.38	64.15	4369	9
149.598053	25.77	45.64	29.01	66.43	4300	9
149.668823	25.01	45.20	20.91	62.40	4091	12
149.738129	24.32	47.47	28.92	66.14	4178	12
149.808914	26.30	50.30	13.49	63.62	4274	12
149.880783	28.97	51.25	31.71	76.79	4491	12
149.952286	37.61	52.48	37.42	82.93	4637	12
149.990845	29.22	39.10	27.18	62.18	693	12
150.028976	37.43	50.37	27.70	77.11	3581	7
150.093582	36.61	48.73	24.74	72.88	4015	7
150.164444	30.04	48.57	22.84	68.62	4103	15
150.234451	31.73	42.60	27.62	67.25	4230	15
150.304276	27.94	37.64	20.81	57.90	4365	9
150.374634	22.22	36.36	21.45	53.24	4430	9
150.445251	20.28	36.91	13.46	48.94	4342	9
150.516647	25.19	39.41	14.96	54.60	4352	22
150.588348	26.09	46.19	15.62	61.27	4320	22
150.659195	24.15	41.88	21.00	57.80	4122	39
150.728500	24.31	58.64	23.54	74.14	4152	39
150.799179	25.18	45.30	23.95	67.02	4285	48
150.870911	30.21	61.05	30.88	84.75	4477	48
150.942459	34.31	58.52	33.52	86.29	4622	39
150.986984	39.56	70.68	26.55	93.15	1208	39
151.022675	33.54	59.72	61.84	103.99	3182	32
151.083374	35.59	61.29	52.15	102.35	4104	32
151.154800	30.68	51.20	51.07	87.29	4098	12
151.224899	31.93	46.94	53.65	86.50	4213	12
151.294739	33.21	53.77	51.92	90.75	4337	32
151.364944	23.67	38.25	50.22	75.25	4426	32
151.435593	20.73	37.82	56.82	79.95	4357	18
151.506470	23.70	41.38	52.05	79.98	4275	22
151.578644	19.20	47.75	46.23	79.66	4350	22
151.649567	18.32	51.29	47.80	80.92	4147	22
151.796051	24.97	50.38	45.79	82.17	3507	15
151.861038	22.13	56.21	48.12	87.00	4423	15
151.932709	28.03	56.34	47.42	92.57	4611	22
151.984497	28.86	62.83	51.72	95.32	2049	22
152.018723	28.27	41.92	24.39	64.68	2327	12
152.072250	27.44	50.80	32.15	74.13	4186	12
152.144150	24.46	50.34	39.03	76.54	4062	27
152.214417	24.44	40.89	29.06	62.31	4184	27
152.284149	22.92	39.02	20.60	54.73	4330	9
152.354401	15.56	35.94	19.72	48.95	4423	9
152.424927	14.03	33.60	18.39	46.23	4373	4
152.495560	16.19	37.07	24.53	52.30	4264	4
152.567841	22.67	45.62	21.74	60.34	4354	4
152.638870	19.46	45.28	19.91	56.60	4178	4
152.708389	18.07	48.19	20.61	59.71	4057	4
152.778824	19.67	45.18	26.65	61.21	4255	6
152.850189	20.76	43.12	25.06	59.61	4365	6
152.921738	25.77	43.65	24.56	63.75	4548	12
152.980133	25.42	58.53	32.37	80.87	2947	12
153.016510	42.00	33.36	19.06	62.36	1517	15
153.062378	29.06	50.10	28.57	73.22	4209	15
153.134476	28.51	46.50	30.96	70.16	4049	15
153.204880	24.91	46.29	32.72	69.16	4178	15
153.274612	25.27	40.32	23.47	59.54	4322	12
153.344727	18.32	33.60	22.08	49.34	4398	12
153.415268	14.19	33.23	17.45	44.83	4392	3
153.485886	16.35	36.58	22.00	50.88	4285	3
153.558151	20.99	44.72	24.52	60.20	4369	6
153.629211	21.18	47.41	20.96	60.34	4208	4
153.699158	16.62	45.88	17.69	55.00	3937	4
153.769180	20.04	43.84	26.65	60.99	4228	3
153.840195	20.87	43.61	21.29	58.05	4297	3
153.911972	27.22	42.83	25.95	63.59	4527	9
153.972778	32.86	47.84	29.20	72.08	3263	9
154.009521	37.90	27.25	45.00	70.53	1218	6
154.052505	32.78	54.93	40.08	85.32	4236	6
154.124786	34.33	48.06	39.41	80.46	4044	6
154.195297	28.89	41.77	43.53	73.52	4152	7

154.265091	29.49	34.78	42.87	69.48	4313	9
154.335083	21.16	32.47	50.13	68.92	4374	9
154.405655	17.57	32.68	49.98	68.47	4406	4
154.556931	21.82	44.22	40.44	70.94	3402	4
154.619583	22.57	46.40	48.14	78.58	4238	4
154.690460	17.04	39.07	52.86	74.48	3636	4
154.759521	19.51	42.12	49.48	76.04	4221	7
154.830490	20.89	41.24	45.36	73.88	4289	7
154.902222	26.37	40.41	47.45	78.39	4517	7
154.968399	31.90	46.44	44.92	82.28	3881	7
155.003479	50.66	28.81	36.99	72.02	592	12
155.042633	32.88	51.71	41.85	83.68	4256	12
155.115204	35.76	49.65	48.12	88.78	4026	12
155.191574	29.00	46.39	40.02	73.76	3483	7
155.255569	27.73	35.83	46.84	71.62	4281	9
155.325455	21.27	33.64	42.53	64.29	4362	9
155.395996	17.96	30.54	53.29	69.37	4428	18
155.466553	18.42	40.43	49.47	74.07	4312	18
155.538528	22.70	47.03	45.02	79.32	4383	15
155.688965	18.10	44.61	48.06	74.72	3162	6
155.749832	20.26	45.16	52.25	81.44	4203	6
155.820770	21.56	48.00	47.31	81.06	4281	15
155.892517	26.63	45.06	47.66	81.82	4513	7
155.964096	35.57	44.32	45.18	82.81	4607	7
155.999313	18.82	59.09	18.28	65.41	119	7
156.034836	36.49	45.09	23.95	70.92	4026	4
156.105408	35.46	47.07	27.41	72.43	4024	4
156.176117	26.49	42.91	24.41	62.53	4116	6
156.246048	28.59	36.19	21.37	55.42	4256	6
156.315933	23.40	32.89	17.43	49.86	4378	12
156.386337	17.39	32.16	16.98	43.98	4427	2
156.456924	15.63	33.16	17.41	44.39	4331	2
156.528687	20.66	40.77	19.02	54.10	4365	3
156.600159	20.05	44.71	18.01	56.04	4295	3
156.670868	18.00	42.19	14.94	51.55	4085	15
156.740204	20.57	56.31	35.38	75.83	4179	15
156.811035	23.05	45.08	23.94	63.01	4274	32
156.882904	25.21	44.78	34.11	68.84	4497	22
156.954361	31.70	53.40	37.03	81.96	4629	22
156.992920	21.59	46.00	22.42	58.34	689	22
157.030563	32.17	61.42	45.76	97.32	3635	27
157.095688	28.97	50.00	39.14	78.79	4018	27
157.166534	22.15	48.38	33.88	69.21	4104	15
157.236511	25.02	44.90	33.71	67.30	4239	15
157.306412	17.03	39.22	27.09	55.43	4376	27
157.376709	14.58	29.22	29.57	49.42	4425	18
157.447357	16.31	37.12	27.86	55.62	4321	18
157.518753	24.24	43.64	49.78	81.50	4345	39
157.590424	20.99	45.94	24.76	60.53	4315	39
157.661285	19.80	45.25	18.39	55.65	4113	15
157.730560	19.66	49.09	26.74	63.82	4163	15
157.801285	20.96	52.18	31.88	71.51	4284	27
157.873001	23.33	44.27	35.88	67.67	4481	27
157.944565	27.84	47.39	23.16	67.48	4618	27
157.987076	33.71	92.68	34.99	108.91	1035	27
158.023529	29.41	41.04	25.52	64.46	3354	15
158.085617	28.07	45.67	25.99	67.45	4080	15
158.162491	23.92	40.70	26.86	60.71	3501	9
158.226959	23.23	37.20	21.86	54.19	4216	9
158.296753	19.87	38.49	14.48	50.66	4346	9
158.367065	13.08	37.53	24.92	50.84	4433	9
158.437668	14.66	33.71	23.25	48.89	4352	12
158.508682	17.34	38.38	28.18	56.50	4301	18
158.580688	22.73	47.95	18.38	59.70	4335	18
158.651672	19.64	48.40	20.74	60.23	4136	48
158.721024	18.35	49.18	21.83	62.00	4124	48
158.791580	22.27	55.24	28.33	72.43	4267	6
158.863129	20.01	42.31	29.31	63.42	4453	6
158.934799	23.64	43.68	30.71	68.79	4621	5
158.985245	28.65	48.56	49.14	83.16	1871	5
159.019424	26.45	44.90	18.40	61.96	2496	6

159.074432	27.42	43.42	28.58	66.49	4170	6
159.146240	25.54	42.64	23.92	62.42	4069	5
159.216431	30.01	36.92	18.47	57.64	4197	5
159.286209	29.48	37.51	14.38	53.99	4333	9
159.356461	21.70	33.87	19.55	49.25	4420	9
159.427032	18.97	32.64	20.50	46.53	4376	12
159.497635	22.08	33.72	22.54	51.57	4260	12
159.569977	23.12	44.72	17.50	57.47	4355	12
159.640961	22.30	45.88	16.99	58.12	4175	12
159.710434	18.85	42.83	20.21	55.71	4073	12
159.780914	15.28	47.36	27.87	62.52	4254	12
159.852356	19.41	52.23	25.41	68.11	4373	12
159.923813	28.32	55.34	31.77	79.38	4561	22
159.981049	27.72	61.66	33.51	82.68	2769	22
160.016785	45.60	42.93	36.15	79.98	1692	12
160.064438	31.96	43.61	46.36	80.49	4199	12
160.136810	29.81	46.94	45.93	81.51	3975	22
160.206940	28.48	42.44	47.11	78.52	4182	22
160.276672	29.88	45.41	45.45	81.08	4311	32
160.346817	18.85	31.48	52.27	70.86	4399	32
160.417328	18.63	42.20	58.51	80.33	4386	94
160.487991	20.25	36.89	56.23	77.65	4280	94
160.640167	28.46	57.47	62.97	100.52	3269	94
160.701172	26.73	76.97	56.39	112.26	3956	94
160.771255	26.80	97.59	64.99	134.37	4239	80
160.842331	31.12	85.04	52.07	117.25	4295	80
160.914062	37.43	73.35	48.27	109.23	4531	48
160.975006	42.99	57.30	52.99	104.53	3280	48
161.011597	35.78	42.87	15.49	60.43	1224	3
161.054642	40.21	54.20	31.04	82.37	4229	3
161.126907	43.56	52.88	24.04	78.80	4050	5
161.197342	36.37	44.57	26.10	68.20	4160	5
161.267166	37.19	42.54	20.08	64.16	4316	5
161.337173	27.05	38.35	21.78	57.42	4372	5
161.407700	22.47	35.88	20.75	51.51	4404	9
161.478363	22.08	38.19	23.09	55.60	4301	9
161.550446	23.76	47.31	18.16	61.71	4369	5
161.621719	22.48	49.51	16.41	62.12	4241	5
161.691620	21.46	47.41	16.28	58.90	3926	4
161.761597	21.34	52.41	36.72	76.94	4220	2
161.832581	26.59	49.03	30.24	71.39	4292	2
161.904327	32.01	46.57	32.41	75.12	4516	9
161.968964	34.19	44.62	28.02	70.39	3703	9
162.004517	49.75	34.59	19.64	66.75	772	22
162.044769	37.76	59.07	34.37	88.51	4254	22
162.117264	42.56	49.64	41.01	85.30	4037	22
162.187775	34.32	42.20	30.92	70.11	4144	22
162.257599	36.37	47.97	35.98	76.71	4294	22
162.327530	27.06	52.51	32.47	77.46	4361	22
162.398056	24.02	51.41	36.61	76.37	4425	32
162.468613	21.06	43.02	28.71	63.22	4300	32
162.540665	26.80	55.79	36.65	79.69	4390	27
162.611984	21.70	55.65	25.55	72.48	4253	27
162.682434	25.44	54.10	18.04	70.45	4025	18
162.751938	17.77	61.84	27.77	81.36	4208	15
162.822861	23.58	57.76	25.08	74.41	4284	15
162.894608	28.19	51.67	30.46	73.85	4516	12
162.965759	35.59	52.72	31.65	79.90	4550	12
163.035446	35.32	61.31	92.78	130.07	4198	7
163.107529	41.43	54.28	97.54	131.86	4024	7
163.178192	36.15	52.27	94.97	125.16	4121	15
163.248123	35.67	41.88	96.38	118.79	4258	15
163.317993	28.77	43.08	93.65	114.67	4375	12
163.388397	21.87	37.04	106.52	121.64	4414	39
163.459015	20.33	46.83	97.26	121.07	4322	39
163.530807	22.17	45.09	103.63	127.63	4374	32
163.602280	22.09	53.15	97.90	127.12	4289	32
163.813080	23.68	56.78	93.13	125.67	4273	39
163.884979	26.77	44.33	100.80	124.10	4506	6
163.956406	37.46	43.78	95.16	122.83	4618	6
163.994980	23.36	40.89	127.93	141.39	684	6

164.032623	45.16	46.95	28.78	78.96	3589	12
164.097794	44.56	49.52	28.18	79.91	4019	12
164.168579	35.29	46.08	27.06	70.47	4101	12
164.238586	35.64	41.48	23.27	64.25	4242	12
164.308456	31.48	39.93	20.18	60.62	4380	18
164.378799	25.26	34.93	20.31	52.67	4427	5
164.449432	22.19	34.72	19.16	51.16	4328	5
164.520874	23.96	43.81	22.16	60.11	4360	22
164.592606	23.62	56.78	32.27	75.46	4311	22
164.663406	22.45	51.18	22.37	66.16	4116	22
164.732635	18.64	52.33	31.71	72.88	4168	22
164.803421	19.02	45.08	33.97	69.33	4277	15
164.875076	26.00	49.80	32.02	71.11	4494	15
164.946671	28.89	39.26	32.92	68.03	4617	15
164.987778	36.93	68.47	30.34	87.19	926	15
165.024841	36.68	39.66	29.13	70.26	3454	6
165.087875	33.80	45.29	32.63	74.97	4053	6
165.158997	28.52	46.97	28.74	68.94	4103	9
165.229004	30.14	42.17	23.71	61.68	4219	9
165.298859	26.55	38.45	15.92	54.59	4353	9
165.369125	19.04	34.79	20.68	49.78	4419	9
165.439758	16.06	35.81	19.96	49.70	4338	12
165.510910	19.10	45.42	28.22	63.61	4338	18
165.582794	20.79	50.34	29.64	67.64	4329	18
165.653778	17.87	46.06	14.83	55.40	4136	7
165.723068	17.76	42.41	21.43	55.46	4134	7
165.793686	20.59	42.39	22.72	57.48	4266	6
165.865234	23.44	42.68	26.06	59.92	4461	6
165.936905	26.99	43.64	25.99	63.62	4612	12
165.985931	30.07	57.31	41.14	88.38	1692	12
166.020187	31.53	50.28	36.42	80.22	2669	22
166.076523	30.49	55.11	44.88	88.52	4173	22
166.148361	26.37	45.26	43.34	75.74	4069	7
166.218491	24.53	38.97	42.43	68.24	4202	7
166.288300	23.89	36.63	46.05	69.29	4329	27
166.358551	18.18	30.09	52.15	68.35	4424	27
166.429153	16.12	31.97	47.83	66.46	4363	9
166.580887	20.03	45.97	37.16	69.08	3371	32
166.643051	21.65	50.51	49.12	79.14	4165	39
166.712509	19.11	47.37	55.49	81.18	4080	39
166.783035	22.60	50.79	53.88	84.60	4259	56
166.854462	24.59	49.15	48.82	80.19	4397	56
166.926208	30.28	49.11	47.69	82.88	4622	39
166.981903	29.16	52.34	38.82	81.65	2592	39
167.017181	37.11	49.18	46.71	85.74	1864	67
167.066605	28.44	48.21	46.49	82.75	4202	67
167.138687	25.67	46.04	40.98	74.75	4056	12
167.209015	25.85	35.52	45.82	70.01	4169	12
167.278732	24.97	35.51	46.70	69.76	4316	12
167.348877	17.36	32.16	44.23	63.75	4402	12
167.419449	16.51	31.78	51.55	69.22	4385	12
167.490097	18.24	38.90	48.26	72.20	4278	12
167.562317	22.68	46.55	45.32	77.82	4362	22
167.633423	20.20	46.94	51.01	80.14	4185	22
167.781403	26.00	55.92	45.41	86.84	3327	32
167.844406	20.00	58.22	50.73	91.61	4298	32
167.916229	24.67	53.60	51.11	89.33	4530	7
167.975769	23.38	62.87	52.17	94.08	3101	7
168.012238	36.48	28.99	9.64	51.19	1382	9
168.056778	29.77	54.56	38.02	82.34	4222	9
168.129028	27.89	45.12	30.24	69.09	4040	4
168.199463	26.39	40.50	23.96	60.09	4166	4
168.269196	26.31	37.76	17.79	54.59	4308	4
168.339264	19.89	34.48	19.86	49.82	4388	4
168.409760	15.19	30.36	19.69	43.81	4406	4
168.480438	17.38	31.63	20.26	46.28	4301	4
168.552536	21.71	43.15	16.44	55.60	4372	4
168.623810	21.56	47.39	16.95	58.75	4231	4
168.693756	15.60	42.55	16.27	50.76	3918	3
168.763702	18.59	42.50	26.93	60.21	4226	3
168.834717	18.94	44.09	25.03	59.08	4289	3

168.906464	22.81	47.14	30.43	66.29	4525	6
168.969574	23.97	56.07	34.57	77.59	3519	6
169.005569	39.64	27.05	9.48	51.75	950	5
169.046906	28.81	46.14	34.09	73.23	4249	5
169.119324	28.69	44.28	25.07	65.82	4039	5
169.189865	27.17	39.56	24.47	60.88	4134	3
169.259689	25.98	37.27	19.68	55.07	4300	4
169.329575	18.91	35.39	18.08	48.98	4354	4
169.400101	20.03	32.15	22.56	49.25	4199	4
169.470718	26.27	34.33	21.64	53.84	4304	4
169.542770	29.62	42.03	25.42	63.97	4381	7
169.614090	25.45	45.32	17.38	60.00	4248	7
169.684418	23.82	41.76	17.18	55.75	4005	9
169.754028	21.12	56.85	19.52	68.92	4212	6
169.824921	27.01	40.84	29.42	65.12	4278	6
169.896713	28.92	41.39	30.53	65.74	4515	7
169.966537	42.24	41.24	24.90	70.05	4373	7
170.000702	56.05	43.33	20.65	73.89	116	5
170.037064	47.39	44.83	27.58	78.91	4263	5
170.109589	48.53	46.78	27.73	81.09	4022	5
170.180283	38.73	44.55	25.01	71.06	4122	2
170.250183	39.87	40.84	17.98	65.68	4266	3
170.320007	33.53	37.42	19.71	59.89	4345	3
170.390503	29.60	32.09	19.56	52.52	4414	6
170.461090	26.47	32.40	22.61	53.65	4322	6
170.532928	30.72	42.00	20.50	62.01	4382	7
170.604385	27.05	46.94	22.38	63.86	4281	7
170.675018	28.94	45.54	16.42	61.80	4074	18
170.744354	20.77	52.33	25.72	68.79	4196	18
170.815231	21.89	53.45	32.37	74.49	4281	27
170.887085	29.80	48.85	37.82	76.21	4507	15
170.958527	39.05	50.35	32.06	79.51	4620	15
170.996521	22.33	31.41	19.79	46.06	594	15
171.033859	47.14	47.95	32.79	84.30	3649	12
171.099915	45.69	47.97	31.31	81.87	4019	12
171.170685	37.80	43.98	28.59	71.26	4108	15
171.240646	39.69	39.61	18.11	63.85	4247	15
171.310562	34.96	37.30	17.49	59.48	4388	2
171.380844	28.58	32.77	18.84	52.02	4420	3
171.451508	24.34	33.21	17.87	50.58	4323	3
171.523026	27.77	40.95	21.55	60.02	4373	2
171.594635	26.29	47.87	21.73	64.61	4304	2
171.665482	24.15	44.22	14.78	58.04	4105	7
171.734741	17.79	43.68	29.52	62.64	4166	7
171.805511	21.88	43.31	35.20	69.03	4276	6
171.877365	22.52	37.66	33.35	62.78	4473	5
171.948792	31.13	44.64	31.12	69.31	4625	5
171.989807	15.79	75.55	55.46	101.49	917	5
172.026443	36.02	42.70	31.82	73.04	3397	9
172.089035	34.36	40.25	34.80	74.71	4027	9
172.160034	28.48	41.02	29.06	65.63	4092	6
172.230087	28.38	39.84	20.17	59.59	4222	6
172.300018	26.23	40.40	17.21	57.25	4362	7
172.370316	18.41	34.47	21.10	49.63	4426	7
172.440887	17.72	31.78	21.59	47.16	4340	7
172.512070	22.37	35.42	25.42	54.29	4339	9
172.583939	22.56	45.81	19.22	59.33	4328	9
172.654831	18.89	45.27	18.55	56.80	4130	4
172.724152	16.22	41.88	28.48	58.82	4134	4
172.794785	19.10	42.24	29.37	61.08	4266	4
172.866455	20.94	41.83	28.82	60.87	4472	4
172.938110	27.45	41.64	24.24	61.83	4624	4
172.986023	22.62	46.35	41.09	69.75	1572	4
173.020966	35.28	42.28	15.94	63.62	2838	4
173.078751	32.02	41.27	30.13	69.98	4150	4
173.150406	28.20	43.23	26.17	64.78	4083	3
173.220581	25.28	37.86	18.58	53.58	4200	3
173.290375	25.88	37.86	26.07	60.31	4340	3
173.360672	18.77	32.97	22.17	49.18	4431	3
173.431229	18.33	33.98	18.64	47.44	4355	4
173.501892	22.18	33.75	24.67	53.79	4263	5

173.574219	24.04	45.68	20.60	59.88	4347	5
173.645172	19.90	44.58	17.84	55.94	4151	6
173.714615	16.51	45.76	18.84	55.65	4077	6
173.785110	16.38	45.87	27.02	61.04	4261	6
173.856659	17.25	48.28	27.50	63.50	4400	6
173.928253	22.07	53.83	30.77	74.43	4604	18
173.982819	22.80	65.42	36.35	87.03	2407	18
174.017746	30.97	40.50	44.76	76.34	2042	22
174.068741	27.70	50.34	45.27	82.24	4193	22
174.140793	25.29	43.44	43.44	72.86	4061	7
174.211090	24.73	37.76	41.49	66.12	4177	7
174.280823	23.38	35.16	45.47	67.19	4314	7
174.350998	15.81	33.75	47.11	64.08	4407	7
174.421555	16.51	35.18	53.61	69.71	4391	15
174.492188	19.35	35.78	46.20	66.42	4265	15
174.644287	20.06	41.96	42.82	68.84	3260	6
174.705154	19.24	47.86	49.86	78.70	4016	6
174.775436	23.01	45.22	53.03	81.57	4247	18
174.846588	20.83	42.65	46.70	73.90	4310	18
174.918304	26.67	42.62	46.67	78.14	4530	5
174.976776	27.92	53.99	37.46	80.48	2960	5
175.013138	44.40	29.73	8.06	58.06	1520	9
175.058914	30.45	48.80	30.81	73.82	4218	9
175.131119	29.38	44.43	25.72	67.72	4044	22
175.201538	24.89	45.42	31.70	68.66	4168	22
175.271301	26.24	34.86	22.53	56.59	4305	7
175.341370	16.76	34.50	16.36	45.49	4387	7
175.411865	15.73	32.31	16.94	43.36	4407	6
175.482559	18.43	33.67	19.62	47.77	4292	6
175.554688	30.62	53.50	40.51	80.49	4370	56
175.625885	25.04	48.74	24.08	64.36	4221	32
175.695862	16.95	42.72	16.52	51.69	3910	32
175.765808	18.98	63.43	38.93	86.35	4229	56
175.836823	20.40	66.03	32.90	82.81	4282	56
175.908569	29.42	63.60	40.27	89.69	4522	27
175.970123	37.46	65.06	43.37	95.73	3335	27
176.006607	37.60	35.03	48.95	75.69	1127	39
176.049057	29.39	61.73	33.60	87.04	4245	39
176.121475	28.74	43.03	24.17	62.88	4040	39
176.192001	23.89	41.96	28.59	62.59	4148	27
176.261765	27.08	47.24	43.55	76.56	4303	27
176.331741	19.60	35.37	26.01	54.99	4365	27
176.402252	16.52	35.19	21.94	50.33	4416	9
176.472870	16.27	37.62	24.12	52.17	4303	9
176.544922	21.80	45.72	22.10	60.00	4373	5
176.616211	21.81	50.07	21.27	62.98	4238	5
176.686462	16.30	46.93	16.69	55.62	3982	4
176.756104	19.68	44.46	21.55	59.03	4228	4
176.827072	21.49	44.33	23.16	60.33	4284	4
176.898849	27.39	40.48	28.06	64.62	4515	7
176.967361	36.46	42.68	20.43	65.76	4190	7
177.001740	45.92	63.52	20.41	81.30	293	5
177.039154	36.73	45.39	25.24	71.60	4253	5
177.111786	34.46	45.89	26.69	71.24	4029	5
177.182388	27.40	43.13	21.92	61.44	4128	3
177.252228	28.53	36.96	15.58	53.08	4277	3
177.322083	22.79	33.74	17.03	49.02	4350	3
177.392593	16.65	30.45	18.97	43.57	4416	3
177.463211	16.02	32.12	20.45	46.25	4320	3
177.535080	22.79	43.23	25.65	60.77	4386	3
177.606522	22.25	49.17	22.06	63.09	4269	3
177.677124	18.02	43.42	17.71	53.58	4061	3
177.746475	19.09	47.25	24.32	60.53	4195	3
177.817337	22.50	42.08	28.11	61.80	4285	6
177.889130	23.96	43.08	30.91	64.47	4510	18
177.960663	30.88	41.42	26.29	65.81	4620	18
177.997574	15.12	32.96	12.21	41.78	415	18
178.033798	37.57	52.98	31.13	80.89	3729	12
178.101013	33.88	49.28	49.74	88.29	4022	12
178.171783	29.39	52.39	59.00	91.81	4106	18
178.241776	32.30	42.17	50.28	79.08	4250	18

178.311707	25.77	45.12	46.17	77.62	4390	32
178.382019	20.42	48.36	57.04	85.81	4426	48
178.452667	17.79	55.80	53.72	90.34	4323	48
178.524185	20.63	59.87	45.16	87.74	4367	56
178.668289	23.06	60.44	49.17	94.18	3904	32
178.735870	24.58	76.49	57.86	112.90	4175	32
178.806671	24.92	67.59	57.62	105.39	4280	80
178.878571	24.84	69.65	59.37	107.53	4484	39
178.950027	33.39	71.28	50.51	106.06	4626	39
178.991119	35.95	81.36	54.94	118.95	929	39
179.028229	34.72	56.50	50.03	94.25	3425	32
179.091248	29.62	52.95	36.50	80.37	4020	32
179.162109	25.39	48.20	34.18	71.91	4083	12
179.232208	27.32	40.63	25.80	61.29	4227	12
179.302124	24.75	35.00	24.31	56.31	4371	15
179.372437	16.84	33.80	25.94	52.01	4430	15
179.442276	17.65	34.63	21.85	49.60	4231	9
179.514221	26.61	46.10	33.30	68.21	4347	22
179.586090	26.66	49.26	37.53	72.53	4320	22
179.656906	22.85	46.51	33.85	66.35	4119	15
179.726273	19.94	44.96	32.74	64.60	4143	15
179.796967	19.26	53.59	46.68	80.11	4271	15
179.868515	19.73	53.58	49.87	82.87	4488	15
179.940247	27.18	52.00	60.99	94.20	4623	22
179.986511	25.89	76.67	86.65	134.69	1391	22
180.021774	34.23	53.24	58.72	96.72	3014	15
180.080948	27.69	54.77	60.82	99.18	4141	15
180.152542	27.12	49.18	57.84	92.37	4086	15
180.222672	28.06	39.38	45.79	74.91	4209	15
180.292694	25.15	38.66	41.28	69.28	4257	5
180.362793	15.89	37.84	50.74	72.25	4433	5
180.433334	17.41	39.09	54.92	77.16	4359	5
180.504074	28.93	42.32	55.67	83.09	4276	7
180.576324	27.06	43.42	88.67	111.27	4344	7
180.647308	25.23	46.37	93.53	117.15	4147	7
180.716721	25.67	49.59	54.07	88.21	4089	7
180.790558	27.93	43.99	41.13	74.09	3191	7
180.858749	30.85	47.98	37.23	75.42	4431	7
180.930359	34.27	52.16	42.78	87.04	4593	15
180.983627	38.37	60.56	25.47	81.75	2228	15
181.018417	34.99	51.39	46.75	91.71	2206	18
181.070938	37.48	60.73	37.63	89.87	4194	18
181.142944	33.50	53.52	31.91	79.95	4060	9
181.213104	31.74	46.65	32.61	73.54	4190	9
181.282944	34.10	46.72	29.55	73.82	4321	12
181.360352	23.53	39.34	31.24	64.05	3518	12
181.423691	23.31	37.64	23.24	56.83	4391	4
181.494308	23.69	38.50	24.97	57.87	4272	4
181.566589	28.06	45.05	30.07	70.34	4357	6
181.637680	24.17	46.23	27.07	67.72	4185	5
181.707199	24.40	44.91	20.30	60.83	4026	5
181.777588	26.95	43.37	22.22	62.21	4254	3
181.848785	25.98	42.49	18.78	58.54	4330	3
181.920456	31.05	46.71	31.84	74.06	4536	5
181.978836	30.16	59.03	20.98	74.58	2948	5
182.015213	43.46	30.94	51.50	85.10	1525	2
182.061050	35.80	50.48	30.53	76.08	4221	2
182.133270	33.30	47.03	28.36	71.86	4048	2
182.203766	29.08	42.67	32.75	68.89	4107	2
182.273361	32.65	37.86	35.30	68.41	4297	2
182.343475	25.50	35.42	34.93	64.09	4395	2
182.414001	22.40	34.24	32.65	59.70	4401	5
182.484695	24.13	35.39	24.69	56.16	4287	5
182.556839	20.67	45.55	18.81	58.41	4372	4
182.628036	22.58	48.94	17.45	59.85	4217	5
182.698029	16.06	42.28	17.44	51.00	3914	5
182.767883	18.41	44.31	23.74	58.75	4226	9
182.838928	21.89	42.36	21.56	58.32	4292	9
182.910690	26.79	46.62	26.24	65.98	4525	6
182.971313	33.41	57.09	26.77	78.37	3233	6
183.008072	37.22	27.09	18.68	52.49	1237	9

183.051178	32.24	54.13	31.75	79.16	4234	9
183.123611	30.09	45.09	26.99	67.52	4043	9
183.194092	26.22	38.98	25.33	60.01	4155	4
183.263840	26.70	36.83	24.18	57.04	4300	9
183.333801	21.13	34.62	20.58	51.30	4368	9
183.404358	16.15	31.87	18.69	43.90	4417	5
183.479523	20.39	30.50	16.59	44.83	3685	5
183.547043	23.53	42.73	18.33	56.60	4373	4
183.618362	23.64	45.37	18.92	58.22	4238	4
183.688522	17.28	41.81	17.77	52.39	3948	3
183.758240	17.73	48.43	24.37	60.84	4215	12
183.829208	19.64	42.43	30.60	63.49	4291	12
183.900955	25.92	41.26	32.23	65.26	4514	9
183.968048	32.91	44.65	22.91	66.13	4006	9
184.002792	50.41	31.86	20.53	64.93	474	4
184.041382	36.26	46.22	23.90	71.36	4260	4
184.113953	34.86	44.50	26.26	70.91	4030	4
184.184509	29.37	43.12	24.48	63.96	4133	6
184.254318	29.41	37.53	15.59	54.88	4285	4
184.324219	23.95	36.77	19.89	52.94	4351	4
184.394714	17.93	33.28	16.50	45.13	4415	3
184.465317	20.58	31.62	21.76	48.93	4313	3
184.537216	24.92	41.25	17.90	56.68	4386	4
184.608688	23.63	46.07	20.06	59.63	4261	4
184.679230	19.44	41.59	22.23	54.46	4051	5
184.748611	18.60	42.60	22.53	55.89	4196	5
184.819458	20.87	43.66	26.59	60.43	4291	4
184.891266	25.29	42.62	27.10	61.61	4516	4
184.962845	34.68	43.07	22.84	66.12	4625	4
184.998596	20.36	26.23	8.10	37.14	235	4
185.034302	35.86	47.62	30.85	76.12	3885	7
185.103165	33.20	43.74	25.51	69.30	4021	7
185.173859	28.98	43.25	27.87	65.92	4109	6
185.243896	30.41	38.38	20.45	58.40	4245	6
185.313721	23.44	35.75	24.44	55.34	4352	5
185.384125	17.87	32.15	22.13	46.70	4422	7
185.454773	19.38	33.48	24.52	50.62	4309	7
185.526337	25.68	39.23	30.87	62.08	4375	12
185.597961	23.57	49.01	18.68	60.96	4292	12
185.668655	20.20	45.07	16.10	55.68	4091	6
185.737976	19.42	47.25	20.03	59.03	4174	6
185.808792	21.44	43.61	25.92	61.44	4279	7
185.880722	23.86	37.73	30.85	62.49	4492	12
185.952148	29.13	45.91	25.20	66.64	4621	12
185.991013	15.08	44.47	21.67	54.67	714	12
186.028870	36.85	48.72	32.66	79.19	3579	9
186.093460	29.17	45.89	31.67	71.83	4018	9
186.164307	26.38	43.44	29.21	67.08	4103	7
186.234360	26.36	40.02	17.40	56.53	4229	7
186.304230	20.94	37.10	15.49	50.34	4375	3
186.374542	16.16	33.69	16.38	44.50	4430	3
186.445175	17.03	34.38	18.50	47.22	4332	7
186.516464	20.70	38.89	22.14	54.41	4359	18
186.588257	24.38	50.44	18.07	63.03	4320	18
186.659073	19.77	43.88	14.51	54.00	4118	7
186.728424	17.38	44.73	24.13	59.55	4148	7
186.799088	19.51	46.69	29.19	64.38	4277	7
186.870636	18.38	52.76	29.38	68.52	4507	7
186.942429	23.25	45.68	29.43	66.10	4613	6
186.986908	24.43	50.03	61.23	92.16	1212	6
187.022644	31.03	42.20	27.27	67.92	3187	5
187.083328	27.42	45.21	29.40	69.71	4103	5
187.154709	23.98	41.99	28.93	64.48	4094	6
187.224808	23.76	37.91	20.09	54.46	4214	6
187.294647	19.17	37.38	19.03	51.22	4354	9
187.364960	13.74	39.73	24.41	54.04	4426	9
187.435471	14.22	33.91	24.07	49.30	4356	12
187.506348	17.11	36.29	23.06	51.68	4290	18
187.578491	22.03	48.50	23.39	64.77	4335	18
187.649445	20.32	47.12	22.00	59.90	4146	15
187.718826	18.54	48.76	21.68	61.35	4094	15

187.789383	19.41	49.58	26.60	65.19	4262	6
187.860916	17.98	43.35	25.70	61.52	4424	6
187.932648	23.16	50.70	27.46	68.64	4613	3
187.984451	24.04	51.42	39.87	75.86	2049	3
188.019119	27.08	40.30	19.67	60.08	2381	3
188.073135	26.84	43.94	31.70	68.75	4188	3
188.145096	22.81	43.88	27.54	64.41	4065	5
188.215317	23.40	36.92	22.05	54.49	4186	5
188.285065	20.63	33.98	16.21	48.93	4328	5
188.355270	14.39	33.15	19.41	45.54	4416	5
188.425812	14.08	31.63	19.01	44.90	4389	4
188.496445	18.00	32.88	26.55	52.12	4266	4
188.568756	25.65	40.29	26.49	61.05	4351	7
188.639801	21.43	44.69	18.52	56.71	4180	6
188.709381	19.40	44.39	24.03	60.57	4031	6
188.779724	21.39	50.34	25.77	66.90	4249	7
188.851013	17.74	47.58	24.70	61.89	4352	7
188.922745	23.11	44.38	33.16	67.59	4563	5
188.980560	18.69	58.26	38.42	79.76	2887	5
189.016800	36.20	39.98	11.58	59.67	1578	7
189.063278	24.34	45.20	33.43	70.02	4211	7
189.133331	23.26	41.85	27.84	63.03	3779	5
189.207657	30.54	39.61	22.25	60.48	3949	5
189.275467	29.75	34.96	16.72	53.50	4306	4
189.345566	22.22	32.74	17.24	47.85	4387	4
189.416122	20.05	29.78	14.45	42.10	4409	5
189.486816	22.78	32.93	19.31	50.38	4282	5
189.559021	23.15	44.19	20.43	58.06	4375	4
189.630157	24.76	47.38	19.21	61.53	4213	4
189.700150	18.76	41.92	18.63	52.75	3918	4
189.770065	18.80	40.31	26.40	57.57	4232	6
189.841049	20.94	38.27	27.60	57.71	4282	6
189.912842	25.63	42.93	29.35	64.30	4525	6
189.973282	28.77	48.27	26.75	67.73	3207	6
190.009964	40.44	25.93	16.22	54.50	1259	6
190.053345	33.88	46.73	26.22	71.38	4238	6
190.125732	33.46	44.02	28.93	70.46	4040	7
190.196198	27.61	40.59	25.86	62.13	4156	7
190.265945	30.34	36.58	14.15	54.31	4300	3
190.335968	21.99	36.44	15.81	50.72	4379	3
190.406479	19.93	32.48	18.93	47.15	4408	6
190.477112	20.89	34.45	23.80	52.77	4290	6
190.549179	23.69	43.43	23.70	60.07	4376	9
190.620514	23.16	46.02	21.74	60.11	4228	9
190.690567	18.57	41.84	21.69	53.92	3936	9
190.760284	15.69	50.09	27.55	63.13	4223	6
190.831345	19.19	48.96	26.73	65.68	4287	6
190.903061	24.59	46.14	32.62	69.14	4514	2
190.968765	31.82	43.19	28.77	69.61	3830	2
191.003479	57.45	25.50	13.01	65.89	591	3
191.042480	39.03	45.23	31.91	76.91	4253	3
191.115021	41.06	44.66	23.45	72.98	4036	3
191.185593	34.27	41.39	25.50	66.76	4135	4
191.255463	35.40	38.46	17.51	60.81	4293	6
191.325394	28.98	34.72	18.60	54.34	4360	6
191.395874	26.18	32.26	16.47	48.55	4415	6
191.466446	24.42	34.02	20.36	51.54	4313	6
191.538422	27.23	43.40	21.19	61.33	4383	6
191.609818	25.58	46.05	18.59	60.45	4257	6
191.680283	23.37	41.98	17.54	55.31	4044	5
191.749710	18.08	46.19	29.99	62.74	4195	5
191.820679	18.34	46.77	26.69	62.52	4276	6
191.892441	27.79	40.51	30.73	64.25	4517	9
191.964020	36.26	47.18	28.87	72.56	4604	9
191.999298	25.31	50.53	20.71	60.76	118	9
192.034836	39.26	52.78	28.88	81.07	4033	6
192.105316	43.73	44.64	31.47	79.33	4022	6
192.176041	34.22	42.56	25.62	67.62	4109	9
192.245972	37.40	35.98	27.21	64.93	4258	9
192.315826	28.72	37.57	32.97	65.25	4366	27
192.386261	24.85	32.70	22.07	53.71	4424	18

192.456833	24.58	31.61	20.35	49.57	4340	18
192.528549	28.97	39.56	25.21	61.45	4376	22
192.600113	26.61	47.81	21.84	63.09	4292	22
192.670746	27.28	43.44	20.77	59.62	4081	22
192.740128	18.73	45.42	27.10	60.47	4183	22
192.810944	21.00	57.02	24.57	71.42	4279	39
192.882812	24.31	41.53	34.26	66.79	4505	15
192.954330	29.77	38.79	30.71	67.77	4634	15
192.992981	16.00	40.08	16.31	48.05	701	15
193.030609	43.55	46.60	22.76	76.60	3629	18
193.095612	36.87	43.17	26.64	72.24	4019	18
193.166443	31.96	49.82	29.12	74.93	4105	32
193.236465	27.70	54.82	25.04	72.99	4235	32
193.306320	25.66	40.74	20.87	58.76	4371	18
193.376648	20.33	34.64	21.65	50.52	4424	32
193.447266	22.62	36.14	23.19	53.23	4337	32
193.518616	26.19	40.72	30.77	63.28	4357	56
193.590363	24.57	44.26	22.95	60.10	4319	56
193.661209	21.31	43.35	19.24	56.05	4117	32
193.730515	16.75	64.02	36.65	82.22	4137	32
193.801224	17.18	60.81	36.97	81.36	4278	32
193.872955	21.80	58.94	34.29	79.95	4476	32
193.944550	28.47	54.52	35.67	80.59	4618	48
193.986984	17.92	119.56	37.82	136.49	1034	48
194.023483	39.47	46.28	48.93	91.32	3358	22
194.085632	32.13	49.61	34.54	76.08	4078	22
194.156815	32.45	45.27	28.39	68.99	4091	12
194.226913	30.97	37.24	23.20	58.27	4217	12
194.296753	28.46	38.04	17.84	55.75	4355	5
194.367050	22.96	33.02	17.80	49.30	4431	5
194.437637	20.44	30.43	19.40	46.15	4343	9
194.508636	22.67	36.66	24.88	55.11	4311	3
194.580627	23.76	45.83	18.96	59.62	4331	3
194.651596	21.06	43.35	18.67	56.01	4143	6
194.720947	18.03	58.14	30.98	72.82	4106	6
194.791534	19.03	61.13	32.89	78.69	4273	6
194.863083	23.19	55.38	34.26	76.42	4437	6
194.934784	30.57	50.85	32.68	76.10	4615	6
194.985260	35.29	55.98	49.76	90.56	1869	6
195.019836	33.73	41.90	32.17	70.79	2553	4
195.075317	34.07	47.94	38.58	80.87	4179	4
195.147186	29.95	45.21	40.49	75.30	4073	7
195.217361	28.23	39.14	42.39	70.40	4199	7
195.287155	26.95	38.47	50.47	75.22	4331	9
195.357391	19.93	28.36	51.07	67.20	4427	9
195.427933	20.64	42.52	53.39	77.94	4377	67
195.498611	23.40	48.73	44.33	77.91	4261	67
195.570908	24.36	51.82	48.35	85.28	4350	132
195.641937	24.88	48.40	74.04	106.89	4163	94
195.788269	16.52	46.46	53.91	81.70	3513	12
195.853088	17.38	48.58	48.02	81.59	4368	12
195.924820	25.63	54.66	49.72	90.67	4554	15
195.981476	20.41	63.98	45.43	90.74	2706	15
196.016800	40.42	40.41	20.32	66.95	1686	15
196.064438	29.79	58.32	34.73	85.01	4208	15
196.136490	29.54	47.60	34.13	73.67	4047	15
196.206879	28.39	43.10	31.28	66.97	4169	15
196.276642	27.36	39.96	27.53	61.17	4314	18
196.346786	18.91	35.96	24.52	52.86	4398	18
196.417328	14.67	35.93	22.71	50.92	4404	27
196.487961	16.90	42.25	29.34	59.91	4286	27
196.560165	21.73	50.45	21.83	65.08	4367	27
196.631317	21.29	54.83	24.23	67.69	4208	154
196.701187	17.96	44.80	22.75	57.66	3940	154
196.771210	22.74	77.14	68.04	114.68	4243	111
196.842209	25.72	68.87	53.45	96.83	4296	111
196.914047	30.51	50.82	23.93	72.13	4521	39
196.975006	35.94	47.62	12.42	67.12	3277	39
197.011627	34.38	46.64	31.52	70.68	1218	15
197.054565	31.96	54.69	28.95	77.30	4227	15
197.126892	29.44	50.72	29.39	72.50	4028	22

197.197342	28.92	42.10	33.64	68.69	4162	22
197.267120	26.36	40.02	18.26	55.70	4302	39
197.337143	20.35	44.27	27.52	63.04	4380	39
197.407684	15.03	47.75	34.79	69.36	4411	32
197.478317	19.92	54.06	42.61	79.81	4294	32
197.550430	23.37	81.93	46.01	106.93	4368	207
197.621674	34.93	59.99	33.45	85.68	4226	207
197.691650	24.24	97.94	62.67	133.52	3917	300
197.761566	41.45	81.33	83.55	139.27	4229	400
197.832520	46.13	270.16	118.07	319.76	4279	400
197.904266	81.81	315.98	171.10	427.34	4492	300
197.968933	85.77	234.30	135.14	330.62	3696	300
198.004517	53.78	422.01	71.97	432.92	772	179
198.044922	62.86	247.32	70.71	279.17	4215	179
198.117249	61.46	186.10	61.09	217.49	4033	179
198.187775	50.52	145.07	70.06	181.62	4140	80
198.257614	56.78	122.45	55.21	158.09	4287	32
198.327530	44.34	113.52	54.24	144.11	4361	32
198.398026	37.09	110.58	52.60	138.07	4413	39
198.468643	34.78	112.34	33.43	130.82	4313	39
198.540726	30.68	100.70	28.04	118.10	4377	39
198.612015	29.40	103.36	21.51	120.40	4255	39
198.682404	30.47	96.98	20.96	117.32	4014	15
198.751892	34.08	98.21	43.98	133.82	4216	7
198.824646	28.99	90.63	23.82	108.64	3852	7
198.894592	45.66	82.31	34.47	117.29	4513	6
198.965714	51.43	79.16	25.92	111.74	4556	6
199.035507	49.14	78.68	25.92	106.56	4208	15
199.107483	57.57	77.14	35.12	110.60	4022	15
199.178146	51.56	67.47	29.46	97.71	4117	12
199.248077	55.71	60.84	30.40	93.74	4260	12
199.318008	48.26	58.46	26.05	86.64	4382	9
199.380463	42.93	55.54	26.73	81.83	3495	9
199.458984	39.19	57.81	26.62	81.21	4326	9
199.530777	42.58	61.87	29.06	87.82	4382	9
199.602310	40.74	68.75	22.42	89.40	4284	9
199.672943	44.09	61.69	17.52	85.12	4077	5
199.742310	38.37	55.01	29.62	84.36	4181	5
199.813141	41.81	51.85	30.42	86.01	4277	4
199.885056	46.69	52.13	33.32	86.80	4436	5
199.956512	56.31	52.65	25.29	89.02	4628	5
199.994949	39.82	42.71	21.84	71.19	681	5
200.032623	58.20	64.33	27.71	98.63	3634	6
200.097794	56.97	58.10	34.31	96.35	4021	6
200.168594	48.66	53.16	32.01	85.70	4103	9
200.238571	47.29	49.27	36.05	83.83	4239	9
200.308502	43.24	47.26	19.92	73.44	4382	9
200.378799	38.13	44.15	20.34	67.22	4426	5
200.449432	34.86	43.41	26.67	68.44	4329	5
200.520828	37.86	48.18	28.80	75.35	4363	15
200.592545	33.78	53.85	21.92	74.07	4311	15
200.663361	34.43	52.33	18.76	71.82	4111	15
200.732681	27.24	51.93	23.81	70.10	4144	15
200.803436	31.55	46.10	24.97	69.74	4271	15
200.875000	42.42	50.94	28.21	79.49	4504	18
200.946716	48.99	47.45	26.09	81.54	4622	18
200.987717	53.84	51.19	15.91	84.24	917	18
201.024353	54.13	55.73	29.02	89.74	3411	9
201.086975	52.79	56.13	31.16	92.14	4045	9
201.157944	46.24	51.98	27.71	81.29	4087	4
201.228043	43.41	43.98	21.74	70.82	4215	4
201.297943	45.20	42.71	15.34	69.98	4358	3
201.368256	36.48	39.87	19.83	63.28	4433	3
201.438812	31.90	38.88	29.23	65.56	4345	4
201.509933	31.46	47.12	29.74	70.57	4335	7
201.581894	27.55	54.44	18.87	69.98	4323	7
201.652771	32.80	49.62	20.61	69.93	4141	32
201.722107	29.10	48.89	25.98	68.84	4111	32
201.792709	33.76	51.00	27.84	73.41	4266	22
201.864304	38.86	43.69	38.73	79.53	4464	22

201.935989	49.26	60.46	42.13	98.90	4602	32
201.985474	44.44	62.71	41.77	98.55	1751	32
202.020203	50.96	48.95	22.99	80.29	2669	39
202.076569	50.09	69.65	44.06	106.37	4161	39
202.148361	46.78	71.64	59.31	116.95	4082	80
202.218536	46.93	65.26	51.42	105.93	4202	80
202.288361	44.77	73.99	51.77	111.35	4334	56
202.358612	39.18	95.70	58.23	131.09	4423	56
202.429169	33.35	91.59	45.79	116.37	4371	48
202.499771	27.03	63.21	46.74	93.70	4259	48
202.572144	30.76	71.78	46.80	103.64	4342	27
202.643112	31.73	74.33	19.95	89.69	4150	9
202.712601	31.71	68.90	21.87	88.04	4061	9
202.783005	32.01	59.67	33.72	89.48	4255	18
202.854370	35.44	61.31	26.32	86.93	4382	18
202.926254	37.58	68.25	28.03	90.24	4594	15
202.981934	33.63	80.41	44.47	107.44	2585	15
203.017303	42.60	53.42	19.68	78.00	1861	12
203.066635	32.32	67.00	33.89	89.27	4208	12
203.138733	31.53	54.47	36.71	81.28	4057	7
203.209000	32.70	45.44	28.03	70.66	4172	7
203.278793	31.74	44.53	18.50	64.13	4314	4
203.348953	22.75	41.15	22.75	60.01	4403	4
203.419495	18.58	37.11	26.90	56.27	4398	5
203.490173	19.33	43.16	33.91	64.93	4269	5
203.562378	22.61	51.13	18.30	64.76	4362	9
203.633514	20.86	54.64	18.56	65.96	4206	5
203.703339	16.74	53.43	25.25	66.76	3962	5
203.773407	21.50	52.94	25.27	69.88	4247	5
203.844406	24.09	50.72	20.05	65.90	4295	5
203.910095	28.83	50.45	23.60	69.56	3774	6
203.976624	31.74	58.89	42.40	88.49	2977	6
204.012238	37.31	36.28	23.70	62.87	1374	6
204.056717	30.38	57.80	39.75	86.31	4227	6
204.129074	30.49	50.53	33.37	76.48	4042	9
204.199524	28.91	43.11	35.39	70.78	4164	9
204.269257	27.46	42.10	22.52	61.00	4302	9
204.339310	19.15	44.83	20.04	59.20	4382	9
204.409821	15.80	49.32	28.12	65.71	4407	18
204.480484	17.14	47.84	30.64	68.93	4291	18
204.552612	21.20	60.14	33.51	82.87	4370	9
204.623901	24.46	64.57	34.78	86.53	4238	9
204.693848	20.14	68.52	32.73	88.51	3914	22
204.763702	24.61	69.41	30.25	90.08	4225	15
204.834717	20.28	61.47	22.11	76.37	4289	15
204.906494	26.78	54.40	24.03	72.57	4516	7
204.969604	32.14	58.31	27.78	80.57	3519	7
205.005569	35.56	52.68	19.75	68.37	950	7
205.047012	32.54	57.19	33.38	82.34	4238	7
205.119446	29.88	51.01	35.89	76.29	4035	7
205.189957	29.49	44.54	29.40	66.31	4143	9
205.259766	31.55	38.28	16.26	57.89	4297	5
205.329697	22.53	37.55	15.48	51.83	4367	5
205.400238	17.38	33.57	15.66	45.36	4419	6
205.470795	17.86	32.65	21.53	48.27	4304	6
205.542831	21.55	45.24	28.34	64.09	4380	22
205.614212	23.61	55.53	30.60	75.63	4252	22
205.684555	18.92	58.33	27.90	76.49	4000	39
205.754044	23.71	73.68	40.65	96.62	4221	80
205.825012	24.09	77.89	33.73	100.95	4277	80
205.896805	30.81	76.24	32.71	100.12	4514	18
205.966568	37.40	71.12	33.51	97.57	4382	18
206.000702	39.76	124.42	33.79	135.00	117	9
206.037216	33.01	73.77	37.72	100.28	4260	9
206.109741	33.81	56.41	37.41	84.34	4024	9
206.180374	29.74	49.47	37.79	77.38	4123	9
206.250244	33.62	43.89	27.35	67.22	4271	5
206.320099	25.75	42.03	18.30	59.23	4341	5
206.390579	19.63	38.17	24.51	56.81	4420	2
206.461182	17.73	38.92	27.15	58.13	4327	2
206.532959	21.45	49.43	28.06	69.21	4377	3

206.604523	20.64	53.78	22.03	67.07	4278	3
206.675125	16.85	49.12	20.83	60.44	4073	2
206.744476	25.80	52.94	28.21	71.98	4190	2
206.815277	26.18	49.49	31.27	73.08	4290	2
206.887146	30.25	49.49	31.79	74.76	4512	6
206.958649	36.52	48.09	25.46	72.91	4631	6
206.996521	18.15	39.28	18.60	50.90	591	6
207.033569	37.19	54.45	29.80	80.35	3628	5
207.098999	31.23	49.75	33.74	75.77	4014	5
207.169785	27.74	47.01	31.97	70.24	4108	5
207.239777	28.66	38.14	20.48	57.08	4233	5
207.309723	24.90	36.19	16.70	53.03	4385	3
207.380035	19.34	34.01	19.69	49.44	4429	4
207.450653	15.76	34.60	21.31	48.27	4313	4
207.522156	19.58	43.10	22.45	57.62	4379	6
207.593796	21.83	51.26	20.41	64.20	4309	6
207.664566	17.82	48.40	17.14	57.68	4104	7
207.733887	22.09	50.48	26.43	67.10	4148	7
207.804657	27.30	45.80	25.86	67.17	4271	5
207.876450	29.42	45.77	29.15	69.72	4469	7
207.947998	31.85	43.64	21.91	66.45	4624	7
207.989273	35.25	84.42	20.89	97.52	949	7
208.026337	30.08	44.35	28.54	69.72	3427	7
208.089279	28.29	47.03	28.91	69.86	4032	7
208.160172	24.71	46.31	28.34	67.09	4086	9
208.230270	25.83	39.52	23.85	58.84	4224	9
208.300140	22.23	57.25	42.69	81.27	4362	18
208.368881	19.02	47.21	33.97	69.37	4143	18
208.441269	19.04	43.52	28.87	62.74	3749	12
208.512177	21.90	46.73	28.96	66.17	4343	22
208.584045	23.28	54.72	43.64	82.64	4324	22
208.654938	21.02	54.38	23.91	68.96	4131	12
208.724243	17.95	59.27	28.04	76.14	4127	12
208.794937	23.98	60.47	29.51	78.74	4259	32
208.866394	29.68	59.18	28.29	80.51	4487	32
208.938248	36.34	50.23	46.22	89.81	4610	39
208.986160	32.23	72.29	49.85	109.03	1570	39
209.021042	43.92	56.84	48.19	98.87	2844	22
209.078827	36.45	64.98	51.64	103.39	4153	22
209.150558	32.28	51.24	42.50	82.65	4085	7
209.220688	33.01	39.10	43.70	75.99	4197	7
209.290497	32.52	40.99	45.24	76.01	4336	3
209.360764	24.66	36.38	46.26	71.39	4424	3
209.431366	19.98	38.17	46.08	71.09	4367	2
209.501984	21.34	42.88	45.40	74.28	4260	3
209.574341	22.80	50.70	43.39	79.24	4352	3
209.645355	20.95	47.20	48.15	78.54	4156	4
209.791824	27.88	49.62	51.58	86.06	3495	6
209.856583	29.03	45.52	48.88	82.95	4396	6
209.928268	33.84	48.50	42.12	84.20	4566	9
209.982864	29.17	59.13	49.06	92.02	2412	9
210.017914	36.22	39.30	19.22	62.92	2034	12
210.068863	30.36	54.94	34.54	81.11	4201	12
210.140961	23.79	51.58	32.07	72.65	4046	15
210.211151	24.35	49.86	38.77	76.01	4188	15
210.281082	25.81	55.80	38.11	81.05	4270	39
210.351105	23.57	39.29	36.93	70.18	4401	39
210.421692	20.22	34.41	25.76	54.86	4386	32
210.492325	22.60	33.51	22.93	53.61	4278	32
210.564590	36.18	44.48	23.94	70.55	4361	67
210.635651	41.20	60.15	29.24	90.56	4191	67
210.705368	48.77	68.95	37.30	106.89	3940	67
210.775604	48.17	64.57	29.72	99.66	4235	18
210.846558	34.71	52.29	25.96	78.42	4294	18
210.918427	38.16	52.73	26.19	80.62	4528	6
210.976608	41.46	70.45	21.29	93.59	2914	6
211.012970	46.82	41.08	14.93	70.55	1548	27
211.059006	38.92	75.16	38.65	104.94	4225	27
211.131317	31.81	55.71	29.98	82.49	4041	22
211.201706	29.90	57.97	45.81	88.02	4169	22
211.271439	31.25	62.78	43.27	92.40	4307	22

211.341492	31.44	42.84	30.88	73.34	4393	22
211.412018	31.19	63.54	57.36	100.25	4399	67
211.482712	32.76	53.60	56.83	93.50	4294	67
211.554840	40.02	55.80	21.56	79.62	4374	39
211.626038	45.38	50.02	19.90	79.25	4224	18
211.696060	40.76	52.87	18.73	77.76	3917	18
211.765915	42.38	55.46	25.32	86.40	4230	9
211.836868	30.92	60.78	19.98	78.70	4284	9
211.908661	38.79	56.71	31.05	87.14	4516	12
211.970261	48.69	58.97	25.09	91.48	3346	12
212.006256	24.42	37.16	15.49	48.60	1069	12
212.048248	35.88	60.97	27.22	82.49	4243	12
212.120575	29.24	59.82	42.70	87.99	4033	12
212.191116	28.26	46.61	36.68	74.18	4149	15
212.260956	25.24	35.63	20.51	53.89	4301	4
212.330948	22.05	33.46	20.47	50.50	4363	4
212.401428	17.50	31.20	18.08	44.47	4420	5
212.471985	18.59	30.14	23.19	47.24	4294	5
212.544067	26.88	42.42	20.34	58.65	4376	9
212.615387	30.74	46.96	21.59	66.19	4254	9
212.685577	30.79	44.94	15.60	62.04	3969	6
212.755295	29.82	44.24	27.00	69.93	4218	7
212.826218	25.42	51.82	20.93	68.22	4275	7
212.897995	30.35	50.51	30.62	75.01	4518	7
212.966919	36.53	46.07	25.08	72.34	4245	7
213.001404	39.95	56.88	29.48	75.69	235	5
213.038422	34.51	50.68	25.26	73.21	4255	5
213.110901	31.92	50.63	34.97	76.22	4032	5
213.181549	24.36	48.18	38.70	72.12	4125	7
213.251450	25.57	36.62	24.78	56.68	4272	18
213.321335	21.84	36.89	18.31	52.20	4364	18
213.391830	16.70	37.45	33.70	60.64	4421	7
213.462387	19.99	35.02	26.25	56.19	4329	7
213.534241	25.50	45.64	27.57	65.44	4379	12
213.605713	28.26	50.71	22.90	68.86	4273	12
213.676239	29.30	48.46	22.43	67.19	4057	15
213.745682	35.13	55.46	35.31	82.76	4187	15
213.816559	30.38	59.72	40.97	87.83	4263	56
213.888351	31.72	49.76	38.30	78.29	4511	48
213.959869	34.96	60.24	38.53	91.25	4625	48
213.997208	23.81	41.66	12.78	54.25	473	48
214.034103	32.31	49.51	31.98	78.98	3789	9
214.101242	30.96	52.73	31.37	76.77	3996	9
214.171997	26.28	48.33	34.49	70.04	4103	7
214.241562	25.50	40.26	24.41	58.99	4184	7
214.311844	24.18	35.08	17.37	51.68	4370	6
214.382187	17.35	33.94	18.48	47.54	4420	9
214.452835	17.62	31.02	23.17	47.82	4317	9
214.524414	21.50	39.28	27.62	57.45	4364	7
214.595978	26.31	47.19	26.00	65.65	4307	7
214.666733	26.31	51.25	22.35	69.50	4089	22
214.736069	29.86	59.55	30.38	83.56	4154	22
214.806870	24.51	59.06	28.31	78.22	4268	15
214.878632	22.53	50.29	37.78	76.46	4474	18
214.950241	31.36	57.19	40.63	89.01	4615	18
214.991287	30.69	87.61	28.93	106.10	929	18
215.028290	34.18	48.82	30.39	78.40	3438	18
215.091507	31.86	53.60	28.33	76.16	4019	18
215.162369	26.54	55.93	50.08	87.14	4095	15
215.232437	26.99	40.57	30.03	65.96	4230	15
215.302277	23.37	36.51	18.04	52.05	4359	7
215.372620	16.19	32.98	17.45	46.24	4429	7
215.443222	16.19	30.24	22.02	45.53	4346	6
215.514404	19.36	36.14	25.76	53.52	4338	5
215.586258	24.79	47.70	16.75	61.04	4325	5
215.657135	21.91	46.23	18.29	59.28	4121	9
215.726486	26.15	48.40	27.49	70.67	4126	9
215.797150	26.09	55.35	25.21	75.25	4271	15
215.868668	22.17	55.25	26.54	73.03	4474	15
215.940445	27.49	47.94	30.87	73.36	4603	9
215.986801	20.84	55.32	38.78	79.25	1393	9

216.021469	37.19	48.82	32.32	78.60	2964	9
216.080185	30.54	50.44	28.32	72.89	4129	9
216.151794	24.10	48.97	33.27	70.71	4080	9
216.221924	22.60	37.56	25.58	56.84	4205	9
216.291733	21.79	33.20	16.38	47.23	4337	7
216.361984	16.23	30.41	18.16	44.08	4422	7
216.432587	14.82	31.20	23.01	46.66	4356	9
216.503250	17.63	33.14	23.57	49.32	4265	7
216.575562	25.07	43.39	18.01	59.72	4345	7
216.646545	24.26	45.76	18.46	59.71	4152	12
216.715881	25.01	46.38	24.28	65.78	4067	12
216.786514	26.62	47.85	24.05	67.94	4255	12
216.857910	20.01	50.48	24.21	66.11	4402	12
216.929703	27.47	48.76	24.63	68.57	4598	7
216.983292	22.94	49.22	37.80	76.62	2281	7
217.018143	39.15	50.19	21.31	72.50	2151	18
217.070190	26.07	57.07	36.06	82.18	4184	18
217.142136	21.41	54.15	40.31	80.42	4066	15
217.212372	24.43	45.51	30.06	67.76	4189	15
217.282227	23.79	41.33	24.87	60.73	4312	18
217.352371	20.03	33.31	24.29	53.43	4407	18
217.422882	19.49	36.46	21.76	51.59	4382	18
217.493652	22.47	38.82	21.88	56.00	4256	18
217.565826	33.09	50.98	28.27	76.32	4358	15
217.636902	30.86	51.44	23.02	72.08	4189	22
217.706543	30.78	58.23	25.54	78.26	4018	22
217.776810	32.62	65.22	31.98	90.71	4249	18
217.847900	23.13	49.82	24.52	68.34	4299	18
217.919693	28.15	50.61	29.33	74.62	4527	12
217.978149	26.56	65.48	34.85	88.99	2954	12
218.014587	42.99	31.00	23.42	62.73	1514	9
218.060287	27.78	53.77	27.05	75.52	4203	9
218.132507	21.43	47.39	27.30	66.58	4041	15
218.203033	134.28	63.90	68.68	182.44	4123	15
218.272690	21.34	40.57	22.77	56.73	4320	48
218.342743	20.46	44.39	26.65	62.25	4390	48
218.413284	15.60	36.19	24.97	52.73	4396	39
218.483917	15.76	41.07	26.82	56.17	4290	39
218.556076	24.10	53.86	25.10	71.55	4375	18
218.627243	24.55	53.59	25.67	72.53	4213	27
218.697250	22.00	50.29	27.69	68.96	3915	27
218.767151	23.50	59.91	23.92	77.04	4237	15
218.838165	17.62	55.39	27.65	71.56	4285	15
218.909943	26.68	48.47	34.79	75.87	4517	27
218.970642	36.83	69.88	43.03	101.73	3250	27
219.007462	34.50	33.27	54.11	81.73	1222	27
219.050522	29.11	63.82	40.14	91.83	4241	27
219.122849	27.22	60.02	45.96	90.24	4021	27
219.193573	25.34	57.44	44.65	85.82	3990	32
219.263153	30.60	38.03	27.12	62.54	4303	9
219.333069	21.19	41.62	17.18	55.53	4359	9
219.403687	16.16	34.56	22.11	48.74	4413	9
219.474243	17.17	35.90	24.87	52.01	4295	9
219.546310	22.63	46.60	22.58	61.50	4381	15
219.617599	23.70	52.33	24.06	68.32	4236	15
219.687866	18.60	47.13	18.74	59.25	3962	12
219.757462	22.27	55.25	24.64	71.49	4227	9
219.828445	20.30	51.97	24.43	66.66	4281	9
219.900192	25.96	53.20	33.79	76.82	4518	18
219.967743	29.49	48.95	29.83	72.30	4081	18
220.002441	45.83	59.55	21.91	78.99	414	5
220.040680	30.39	49.91	26.43	71.39	4255	5
220.113174	29.41	46.49	30.45	71.07	4033	5
220.183762	25.84	41.79	28.46	63.71	4108	4
220.253662	27.95	38.16	22.52	57.67	4271	6
220.323486	20.63	37.67	19.04	52.78	4350	6
220.394028	16.38	34.50	23.90	50.25	4430	12
220.464813	16.16	41.24	32.80	60.74	4231	12
220.536484	21.38	40.45	25.53	59.45	4382	12
220.607956	22.38	49.22	17.96	61.55	4270	12
220.678467	18.03	46.11	16.54	56.03	4044	5

220.747894	19.48	50.68	29.20	68.82	4188	5
220.818756	21.65	46.99	24.68	63.79	4272	7
220.890503	27.69	44.79	26.84	66.24	4522	7
220.962112	34.78	44.42	25.94	69.39	4631	7
220.998245	22.91	41.16	11.88	51.26	294	7
221.034256	34.70	50.20	27.77	76.39	3872	6
221.102402	36.26	45.24	29.06	73.26	4025	6
221.173187	28.19	43.43	29.63	67.23	4113	5
221.243195	31.21	36.84	24.67	59.74	4252	5
221.313126	26.07	38.99	17.07	55.78	4393	7
221.383438	20.50	31.82	23.16	49.79	4431	5
221.454071	18.00	33.15	20.83	47.42	4318	5
221.525696	23.01	43.03	25.28	61.00	4359	9
221.597244	22.85	47.52	18.59	60.07	4302	9
221.668045	20.10	45.19	19.64	58.22	4082	6
221.737320	17.40	43.02	25.37	58.40	4151	6
221.808075	20.61	52.05	26.29	68.54	4266	7
221.879929	24.04	45.99	28.33	65.22	4481	7
221.951447	32.10	44.82	27.35	67.89	4621	7
221.991318	24.28	52.33	33.30	70.53	805	7
222.028687	36.41	49.98	32.23	79.50	3541	6
222.092773	32.44	46.79	29.86	72.48	4028	6
222.163589	29.18	45.65	27.39	67.27	4078	6
222.233658	30.45	36.86	21.81	58.33	4228	6
222.303513	28.11	36.54	15.44	54.08	4369	4
222.373856	20.07	31.90	21.65	49.15	4432	4
222.444473	17.61	33.76	24.94	50.21	4342	4
222.515793	20.25	38.74	24.21	56.09	4350	4
222.587540	23.53	45.66	18.18	59.75	4325	4
222.658417	20.38	43.89	16.28	55.52	4108	4
222.727768	18.89	41.39	27.76	58.72	4126	4
222.798431	19.56	46.53	25.64	61.92	4259	4
222.869843	22.02	48.84	25.56	65.50	4506	4
222.941696	28.03	52.59	25.07	70.77	4613	9
222.986801	28.68	46.55	50.29	81.04	1266	9
223.022354	31.71	41.78	18.19	62.92	3127	4
223.082626	32.42	44.85	30.60	72.50	4099	4
223.224136	26.97	41.47	31.74	65.35	4204	12
223.294098	26.45	54.97	34.93	77.57	4271	39
223.364197	19.24	35.66	23.33	54.41	4423	39
223.434799	16.13	35.81	24.05	53.48	4362	27
223.505600	18.14	43.59	30.56	62.82	4260	32
223.577820	23.84	49.60	21.91	65.50	4344	32
223.648743	21.54	48.78	19.32	61.50	4134	15
223.718140	19.38	55.39	24.90	69.65	4076	15
223.788742	20.58	58.32	25.91	74.84	4259	18
223.860138	19.84	57.80	31.17	76.36	4423	18
223.931824	32.16	77.75	47.92	114.59	4577	56
223.984192	33.25	94.32	72.78	142.01	2103	56
224.018890	33.33	62.37	55.55	106.03	2322	67
224.072418	29.57	90.70	51.90	121.82	4180	67
224.144394	28.82	84.44	57.41	120.13	4068	67
224.214600	34.30	100.87	75.64	142.81	4193	67
224.284393	35.34	81.72	54.67	118.99	4328	48
224.354507	23.79	69.06	41.37	95.31	4407	48
224.425110	17.04	58.03	36.05	79.21	4381	32
224.495834	19.13	66.89	42.35	90.37	4264	32
224.568069	26.31	70.17	30.25	92.60	4358	32
224.639160	23.91	61.72	26.30	81.50	4190	12
224.708801	21.19	67.97	23.20	83.27	4021	12
224.779099	27.78	77.25	32.27	96.83	4244	48
224.850174	20.91	80.81	32.34	101.09	4312	48
224.922089	30.08	79.89	44.00	109.09	4557	67
224.980270	22.12	76.54	38.16	96.57	2940	67
225.016525	45.12	52.36	22.07	77.56	1537	48
225.062592	25.92	51.31	34.69	77.09	4208	48
225.134796	28.84	100.88	105.75	162.19	4034	154
225.205109	26.63	62.71	59.72	100.49	4167	154
225.274841	40.13	157.92	119.78	222.26	4315	179
225.344955	47.90	201.22	142.20	272.21	4383	179
225.415588	44.68	171.32	103.94	221.31	4368	179

225.486191	34.59	143.68	77.72	183.75	4283	179
225.558350	42.99	125.80	66.32	175.46	4379	154
225.629532	38.15	125.09	89.28	190.29	4216	154
225.699554	36.18	141.37	42.24	166.44	3918	154
225.769409	38.32	129.68	50.74	158.50	4231	94
225.840439	25.05	119.41	33.21	135.34	4276	94
225.912170	40.40	98.44	35.24	126.30	4517	22
225.972519	48.12	91.51	44.92	133.62	3203	22
226.008926	33.75	61.85	22.59	77.79	1205	32
226.051758	38.96	71.72	32.32	97.99	4242	32
226.124069	41.13	64.77	27.63	88.02	4030	32
226.194580	34.90	42.24	28.39	68.72	4155	67
226.264404	37.50	46.76	28.16	72.33	4306	15
226.334381	27.97	49.62	22.61	68.00	4378	15
226.404938	24.47	48.93	26.53	66.91	4404	6
226.475525	22.06	51.80	27.67	68.19	4305	6
226.547577	24.98	60.53	22.87	75.33	4377	9
226.618896	23.51	59.84	17.35	72.58	4250	9
226.688950	22.80	53.39	15.86	66.19	3946	6
226.758774	26.97	49.26	25.36	71.96	4222	6
226.829712	29.82	47.23	26.36	73.36	4281	6
226.901459	39.78	48.03	28.15	78.92	4519	12
226.968094	43.41	48.23	20.11	75.94	3949	12
227.003143	53.15	73.72	38.62	101.24	531	3
227.041962	42.98	55.70	39.28	91.77	4254	3
227.114349	41.38	54.62	42.46	90.95	4014	3
227.255051	38.09	41.74	46.09	82.38	4254	3
227.324768	31.84	42.26	45.41	78.11	4341	3
227.395370	25.98	40.29	47.44	75.68	4422	4
227.465820	21.97	41.40	48.10	75.32	4322	4
227.537796	25.51	50.20	46.98	83.59	4374	9
227.609177	24.45	52.54	44.36	84.05	4275	9
227.679764	22.59	47.75	44.89	79.44	4050	18
227.749191	18.51	48.13	49.56	82.71	4191	18
227.820053	25.74	55.11	50.37	89.28	4261	22
227.891815	34.19	43.75	51.43	88.11	4512	32
227.962799	41.35	53.41	47.44	94.62	4532	32
227.998978	26.02	77.77	24.60	87.37	115	32
228.033813	43.78	47.33	26.76	77.05	3737	15
228.105743	44.14	48.98	30.94	80.99	3148	15
228.175400	45.73	52.81	31.73	84.65	4105	22
228.245377	48.55	43.25	25.84	75.95	4252	22
228.315262	40.84	42.90	16.00	66.66	4378	4
228.385696	36.64	40.29	24.16	66.08	4438	6
228.456253	31.26	35.44	29.72	64.82	4328	6
228.527969	34.35	46.73	27.13	71.29	4375	5
228.599472	31.37	54.76	18.26	72.47	4299	5
228.670181	34.85	50.59	17.66	69.75	4084	5
228.739487	26.29	42.58	26.60	63.36	4167	5
228.810318	29.91	45.28	24.03	65.47	4262	6
228.882202	40.61	43.64	29.02	73.82	4487	5
228.953644	47.93	46.67	27.65	79.91	4626	5
228.992203	31.00	39.03	24.36	61.29	687	5
229.029877	56.18	54.31	34.47	93.30	3659	7
229.095032	54.37	53.98	35.72	93.64	4029	7
229.165878	43.03	49.55	29.36	78.99	4088	7
229.235886	45.92	43.36	23.42	74.12	4225	7
229.305725	42.23	39.67	16.20	67.35	4365	9
229.376007	34.11	36.61	23.21	62.05	4424	5
229.446671	31.33	37.99	23.99	62.57	4345	5
229.518097	32.15	49.58	27.05	72.87	4346	7
229.589752	28.75	51.21	22.39	69.46	4322	7
229.660629	33.84	49.52	16.17	68.54	4117	5
229.729935	24.60	42.30	22.19	59.60	4136	5
229.800613	26.97	46.48	26.35	65.56	4268	6
229.872177	34.94	42.30	29.32	68.69	4486	6
229.943893	46.53	44.84	23.39	74.90	4628	7
229.987152	42.60	42.23	40.36	80.12	1093	7
230.022842	49.37	44.96	24.77	78.53	3253	7
230.084045	51.24	53.06	30.17	87.56	4062	7
230.295456	43.11	40.42	28.85	72.84	4311	6

230.365433	33.79	37.42	21.61	62.68	4429	6
230.436081	29.86	33.79	23.13	58.43	4365	7
230.506882	31.86	41.08	26.36	65.26	4268	6
230.579102	28.40	50.55	19.19	68.13	4349	6
230.650024	24.94	43.04	43.96	73.60	4146	4
230.719391	23.22	45.81	83.70	103.70	4091	4
230.789948	28.52	44.84	61.49	89.37	4260	5
230.861511	29.27	38.79	49.53	75.51	4436	5
230.933151	33.70	40.38	39.23	73.17	4589	5
230.984543	40.23	40.40	14.48	62.72	1984	5
231.019241	31.95	39.00	25.62	66.33	2445	6
231.073746	36.92	44.86	15.53	66.17	4171	6
231.145599	34.03	43.00	21.93	65.05	4074	5
231.215836	32.82	33.32	26.50	60.12	4194	5
231.285660	34.98	33.53	20.09	57.91	4345	2
231.355835	25.82	31.27	16.15	49.88	4426	2
231.426361	20.88	31.18	14.32	45.60	4371	2
231.497086	22.04	33.37	18.58	50.90	4249	2
231.569336	25.01	41.88	16.12	56.56	4358	2
231.640335	22.26	44.85	14.97	56.53	4177	3
231.709900	22.11	40.39	27.02	57.83	4046	3
231.780319	27.50	40.04	26.52	60.26	4252	3
231.851562	27.07	37.15	28.93	60.74	4321	3
231.923233	32.56	39.78	31.92	67.21	4544	3
231.980743	30.36	45.67	17.60	63.33	2812	3
232.016769	39.92	30.60	41.72	70.28	1629	4
232.063812	35.36	44.13	23.47	67.29	4213	4
232.135864	33.86	42.68	20.90	65.62	3973	2
232.206299	31.57	34.49	24.83	58.82	4166	2
232.276154	35.62	31.55	22.35	58.46	4332	2
232.346191	26.41	32.72	13.64	49.28	4381	2
232.416779	19.80	32.85	14.69	46.37	4390	3
232.487442	21.51	33.71	12.52	47.55	4263	3
232.559601	23.52	42.96	13.51	54.75	4378	4
232.630768	23.77	43.75	11.62	55.11	4212	9
232.700714	20.93	40.11	26.47	56.84	3928	9
232.770630	25.60	41.39	37.37	66.78	4241	5
232.841675	25.70	37.64	38.46	65.67	4287	5
232.913452	31.52	37.90	30.22	65.47	4516	4
232.973999	34.27	48.37	24.74	71.53	3231	4
233.010803	38.23	27.51	28.50	57.78	1239	0
233.054031	34.92	45.10	35.90	73.20	4238	0
233.126328	35.19	42.73	29.13	70.37	4036	2
233.196823	31.26	34.82	30.63	62.21	4154	2
233.266647	36.41	30.97	20.34	57.98	4306	0
233.336594	26.43	30.73	12.90	47.32	4376	0
233.407166	20.63	29.72	13.65	44.26	4403	6
233.477829	20.82	32.33	19.53	47.85	4290	6
233.549789	24.70	40.20	17.44	55.15	4375	3
233.621124	22.88	42.00	17.25	55.22	4238	3
233.691208	20.41	41.67	25.62	57.34	3932	9
233.761002	23.88	43.19	41.42	69.50	4231	7
233.831970	25.28	40.04	25.46	58.65	4281	7
233.903687	30.34	38.27	37.08	68.25	4512	4
233.968918	32.24	41.95	32.13	70.76	3776	4
234.004166	50.30	37.20	36.09	75.51	712	7
234.044220	32.49	48.03	25.17	69.30	4254	7
234.116684	32.93	44.51	27.65	68.85	4016	7
234.187210	28.57	45.55	30.11	68.81	4123	18
234.257156	34.76	33.55	24.66	60.90	4277	6
234.326996	27.24	36.32	14.55	54.09	4359	6
234.397568	22.07	32.71	15.13	49.55	4414	12
234.468109	19.53	37.43	18.97	52.46	4311	12
234.540039	23.64	40.79	18.35	56.60	4382	6
234.611420	21.20	49.11	21.72	62.15	4268	6
234.681900	20.63	48.46	20.35	62.10	4033	6
234.751419	21.64	56.06	25.74	74.00	4199	7
234.822281	23.69	57.88	26.57	76.55	4268	7
234.893951	31.97	58.13	38.60	86.66	4512	22
234.965622	36.92	50.84	35.43	81.43	4633	22
235.035065	35.86	52.80	25.13	76.28	4131	5

235.105927	36.97	48.85	30.17	75.73	4028	5
235.176651	30.97	45.17	27.33	67.76	4117	5
235.246643	36.04	38.65	24.88	63.33	4259	5
235.316452	28.64	37.98	16.72	55.47	4345	3
235.387024	20.23	33.63	19.67	48.55	4428	0
235.457565	17.73	32.02	19.37	46.78	4308	0
235.529282	22.11	39.28	22.35	56.53	4381	2
235.600769	22.31	47.53	18.15	60.24	4294	2
235.671448	18.33	42.64	14.09	52.11	4086	2
235.740845	19.55	42.72	22.72	56.96	4162	2
235.811569	21.99	40.67	24.20	58.54	4269	0
235.883453	26.51	41.18	30.32	64.37	4505	3
235.954926	33.66	43.41	25.00	68.01	4608	3
235.993744	19.40	43.73	19.07	55.86	712	3
236.031387	37.12	44.39	33.77	75.51	3635	2
236.096283	32.23	47.09	39.66	79.06	4030	2
236.167099	28.66	45.24	37.07	72.19	4084	0
236.237122	36.37	37.31	41.98	76.14	4236	0
236.307007	25.44	35.08	42.25	66.71	4375	3
236.377380	17.66	33.78	51.89	69.19	4425	7
236.447952	16.01	38.21	51.18	72.49	4336	7
236.519333	19.29	44.83	49.98	79.51	4352	9
236.591095	21.32	49.92	44.46	80.52	4315	9
236.661926	20.06	44.61	46.16	74.25	4122	18
236.808411	28.90	52.00	54.72	92.81	3507	9
236.873444	27.70	46.77	53.62	88.38	4515	9
236.945221	33.04	45.53	45.88	84.54	4623	5
236.986359	39.62	62.11	71.50	113.99	925	5
237.023727	30.99	42.89	24.99	68.23	3427	9
237.086487	30.85	47.23	28.52	71.63	4041	9
237.157440	26.88	44.64	28.15	65.87	4062	15
237.227600	27.76	39.77	31.50	64.04	4217	15
237.297455	24.28	35.30	16.35	50.90	4362	12
237.367691	18.13	33.23	17.08	46.82	4426	12
237.438232	14.84	35.24	18.03	47.18	4347	7
237.509186	17.75	38.01	19.75	52.37	4272	6
237.581360	21.91	47.34	16.77	59.46	4339	6
237.652283	19.12	46.63	14.19	56.37	4140	5
237.721512	22.29	43.85	22.18	60.09	4097	5
237.792252	27.22	43.46	29.94	67.85	4267	4
237.863739	25.66	41.18	27.16	64.04	4442	4
237.935455	30.28	45.56	23.79	68.33	4608	3
237.985413	36.05	47.07	28.23	73.22	1810	3
238.020065	25.91	44.74	16.95	63.18	2617	0
238.076096	31.14	50.55	24.97	72.37	4152	0
238.147842	32.57	45.35	27.48	69.47	4069	4
238.218094	31.00	38.04	22.36	59.60	4210	4
238.287903	31.83	37.32	14.24	56.29	4350	2
238.358063	22.38	34.91	18.09	49.81	4427	2
238.428635	19.59	36.95	16.40	48.99	4369	2
238.499390	19.89	35.09	23.23	52.59	4247	2
238.571594	21.99	45.15	15.84	57.17	4348	3
238.642654	22.45	45.94	14.88	57.44	4166	3
238.712143	18.60	46.79	18.75	57.37	4048	3
238.782608	23.27	42.81	27.55	63.49	4249	6
238.853836	24.77	45.21	22.32	61.40	4360	6
238.925522	31.66	44.17	23.31	66.29	4546	4
238.981415	29.46	53.40	29.87	75.92	2501	4
239.016891	39.04	33.55	20.61	61.66	1709	4
239.065155	34.00	46.34	26.47	71.59	4199	4
239.137192	31.70	44.90	25.75	68.53	4049	5
239.207611	30.12	40.60	26.68	63.17	4171	5
239.277435	32.15	41.33	24.92	63.97	4325	6
239.347488	20.08	41.97	25.15	59.37	4403	6
239.418015	15.77	36.66	19.56	48.64	4381	5
239.488678	18.46	37.63	23.48	53.52	4268	5
239.560928	21.71	45.91	17.47	60.23	4377	6
239.632050	21.73	46.43	16.19	58.10	4200	5
239.701904	15.82	45.74	17.74	55.12	3943	5
239.771896	20.72	42.26	26.20	61.31	4238	3
239.842926	23.45	40.47	25.93	60.90	4286	3

239.914764	30.42	40.80	28.68	65.79	4529	3
239.975204	33.52	44.87	28.68	70.63	3210	3
240.012009	39.08	26.68	14.57	53.46	1251	7
240.055344	35.06	49.58	27.67	74.47	4236	7
240.127563	37.66	44.32	24.87	71.46	4028	4
240.198074	31.89	40.05	24.01	63.65	4162	4
240.267944	34.67	38.75	17.02	59.56	4302	3
240.337784	26.35	38.15	17.02	54.84	4373	3
240.408432	21.07	36.69	17.35	49.77	4398	4
240.479080	21.44	35.42	21.53	52.57	4286	4
240.551086	24.63	41.32	20.23	58.70	4372	12
240.622437	25.10	45.75	23.08	62.17	4234	12
240.692398	18.27	43.50	15.93	52.91	3928	7
240.762283	19.49	40.25	24.04	55.91	4231	7
240.833237	20.71	41.89	22.14	56.63	4277	7
240.905029	27.66	39.56	28.44	62.58	4515	9
240.969131	30.98	44.72	27.52	68.25	3641	9
241.004868	45.05	26.73	14.59	56.25	830	9
241.045471	34.06	49.09	30.41	75.74	4243	9
241.117889	35.71	44.73	30.37	73.34	4021	9
241.188477	31.05	41.71	26.19	65.62	4125	5
241.258408	32.17	36.30	17.06	56.54	4280	7
241.328247	23.17	41.20	15.88	55.24	4365	7
241.398849	18.51	36.22	22.51	51.49	4419	18
241.469437	19.00	36.84	28.92	56.77	4306	18
241.541382	22.57	43.71	36.64	71.35	4385	27
241.612747	24.43	47.73	18.33	61.96	4273	27
241.683167	20.37	47.58	19.36	60.39	4030	48
241.752594	20.75	60.26	44.45	90.20	4217	56
241.823517	22.91	44.05	27.08	64.47	4274	56
241.895294	28.53	52.90	42.54	82.60	4519	48
241.966019	37.19	57.77	47.60	95.53	4502	48
242.035782	37.18	71.47	52.88	112.68	4284	67
242.108276	36.44	52.60	42.07	86.94	4020	67
242.178940	31.71	49.35	48.83	84.59	4119	39
242.248917	37.51	56.12	46.35	91.02	4260	39
242.318756	29.01	42.40	20.32	61.59	4380	48
242.389206	23.82	39.38	26.54	60.39	4415	27
242.459839	19.39	38.77	18.34	53.07	4311	27
242.531586	25.37	48.32	27.35	67.58	4384	15
242.603027	23.18	51.53	22.12	66.71	4285	15
242.673706	22.65	54.18	32.98	74.95	4078	32
242.743042	18.36	50.40	32.69	70.92	4183	32
242.813843	25.37	64.99	53.43	101.30	4264	39
242.885666	31.68	48.45	33.48	75.46	4509	15
242.957153	39.42	50.82	33.42	80.96	4606	15
242.995819	23.77	49.29	25.92	64.09	711	15
243.032852	41.92	56.97	43.03	94.79	3599	22
243.097549	38.05	53.27	40.02	85.96	4030	22
243.168350	31.46	46.27	33.55	72.99	4106	15
243.238434	36.78	41.11	22.17	64.76	4228	15
243.308304	32.77	36.83	16.72	57.60	4384	7
243.378693	24.17	34.21	21.64	53.05	4409	12
243.449234	18.71	36.95	20.03	50.38	4326	12
243.520630	22.75	41.80	22.63	58.35	4344	9
243.592361	23.07	48.22	19.79	63.18	4298	9
243.663223	20.98	45.28	16.72	58.40	4113	9
243.732407	18.01	44.81	25.47	59.76	4157	9
243.803223	21.73	44.04	25.24	60.91	4263	7
243.874756	26.92	44.85	35.13	71.56	4514	7
243.946548	37.31	42.64	29.16	72.45	4619	18
243.987946	40.76	46.19	30.77	77.09	964	18
244.024994	33.94	43.23	25.63	69.20	3425	18
244.087799	35.40	50.40	38.90	81.32	4029	18
244.158722	34.28	45.62	33.31	73.62	4089	12
244.228943	35.23	37.14	23.42	62.11	4217	12
244.298752	31.77	39.71	17.06	59.04	4374	9
244.369110	22.63	35.88	25.56	54.82	4427	9
244.439560	17.32	34.64	28.28	54.72	4343	18
244.510529	21.01	38.73	32.39	62.37	4277	15
244.582672	22.01	49.22	25.12	66.12	4341	15

244.653580	21.47	50.14	22.31	64.11	4156	12
244.722870	18.01	48.80	25.50	63.74	4116	12
244.793549	23.05	48.52	28.78	67.98	4260	7
244.865036	24.06	50.33	32.27	71.29	4469	7
244.936859	29.86	55.22	37.70	83.35	4588	18
244.985733	32.09	54.45	40.13	84.52	1688	18
245.020493	29.56	48.81	27.82	72.02	2739	18
245.077515	28.79	53.50	36.72	80.92	4135	18
245.149139	28.41	47.42	30.63	71.78	4079	12
245.219360	30.29	41.89	31.00	66.75	4217	12
245.289246	29.36	43.74	22.51	65.48	4351	22
245.359375	21.03	33.43	22.57	51.99	4410	22
245.429932	16.26	37.72	18.28	50.59	4375	18
245.500549	18.70	37.30	28.54	58.19	4230	12
245.572922	24.03	48.37	22.11	65.25	4363	12
245.643906	22.08	50.90	19.25	64.34	4173	12
245.713394	22.71	53.59	22.72	68.58	4062	12
245.783890	27.73	54.94	35.43	80.69	4252	22
245.855133	23.98	52.64	24.21	68.62	4372	22
245.926941	28.40	49.88	26.46	70.81	4571	12
245.982346	30.72	54.10	37.17	82.88	2511	12
246.017456	33.85	40.58	34.21	72.04	1913	27
246.067474	27.66	51.28	39.25	78.90	4197	27
246.139420	27.20	54.49	42.94	84.22	4050	22
246.209900	26.94	46.64	38.35	74.47	4186	22
246.279709	27.69	54.58	36.09	79.26	4320	32
246.349792	19.28	49.69	34.94	72.31	4401	32
246.420258	18.54	57.52	32.61	75.21	4389	32
246.490997	18.66	65.60	30.62	80.53	4257	32
246.563202	25.28	67.15	28.05	85.87	4373	27
246.634293	27.04	61.47	27.85	81.55	4197	27
246.704147	25.87	60.30	26.01	79.02	3965	27
246.774185	30.02	59.34	24.75	78.51	4247	9
246.845230	23.26	51.79	28.97	71.58	4288	9
246.917023	31.47	49.11	36.54	77.65	4521	9
246.976059	31.05	44.31	32.28	70.38	3031	9
247.012558	37.11	34.55	7.85	55.27	1431	3
247.057648	32.37	47.73	26.07	71.30	4233	3
247.129898	32.78	46.90	26.11	70.18	4044	7
247.200302	31.54	39.89	25.61	62.83	4156	7
247.270187	31.56	36.76	16.81	57.26	4301	3
247.340042	22.77	35.62	18.52	52.60	4374	3
247.410690	17.91	32.92	18.65	46.84	4400	3
247.481354	19.28	32.18	23.59	51.33	4283	3
247.553436	22.72	43.76	20.65	60.02	4360	5
247.624664	23.03	47.41	23.07	64.28	4225	5
247.694702	15.81	45.72	15.67	54.41	3933	6
247.764511	20.95	41.99	26.50	60.26	4231	15
247.835281	22.35	46.32	31.67	67.44	4254	15
247.909866	27.67	50.00	31.76	75.05	3181	12
247.969208	31.10	50.72	33.01	74.61	3333	12
248.005432	36.03	32.61	10.84	53.06	907	5
248.048630	41.99	50.51	32.88	80.44	4017	5
248.119171	43.28	48.69	30.75	78.57	4026	5
248.189758	39.09	42.29	27.88	71.08	4136	4
248.259689	41.03	39.79	21.05	65.07	4285	6
248.329498	31.88	37.50	21.61	60.56	4357	6
248.400116	25.96	37.00	25.32	56.35	4415	6
248.470718	23.92	35.01	24.53	56.17	4304	6
248.542725	44.54	64.34	24.69	89.71	4374	12
248.613953	28.19	48.20	21.61	65.39	4261	12
248.684357	21.46	44.58	17.45	56.47	4021	15
248.753891	20.70	62.57	36.53	83.79	4223	67
248.824860	25.06	63.05	50.09	99.55	4267	67
248.896591	32.25	66.86	50.65	105.23	4525	27
248.966415	35.61	53.33	40.76	86.50	4374	27
249.000687	45.39	95.23	29.82	109.73	116	5
249.036972	35.94	55.24	38.65	85.32	4269	5
249.109497	34.41	48.61	48.28	87.14	4028	5
249.180191	26.97	45.54	61.37	92.68	4111	6
249.250153	32.16	43.72	58.04	91.21	4264	5

249.319931	25.15	44.88	57.92	89.35	4354	5
249.390472	19.02	46.44	57.91	88.51	4419	4
249.461105	19.01	44.64	61.23	90.57	4335	4
249.532867	32.79	52.81	57.12	95.20	4383	5
249.604294	26.73	48.36	83.44	107.39	4287	5
249.674973	25.69	45.15	56.84	84.87	4080	9
249.744324	21.14	47.42	50.50	78.13	4175	9
249.815170	25.55	49.24	30.51	68.11	4259	15
249.886963	32.37	48.08	26.07	68.64	4514	9
249.958542	37.75	46.00	27.80	70.40	4638	9
249.996506	21.46	39.29	9.79	47.34	592	9
250.033737	41.20	47.02	15.10	70.66	3691	5
250.099854	42.32	43.41	19.26	70.26	4031	5
250.170639	35.23	40.52	22.70	65.18	4104	3
250.240631	39.22	35.13	25.88	65.49	4245	3
250.310532	36.28	36.17	21.27	62.32	4374	5
250.380875	28.71	34.01	22.33	56.64	4424	2
250.451492	24.25	33.98	17.18	51.81	4301	2
250.522919	25.45	39.73	17.23	56.90	4354	9
250.594620	26.58	45.63	13.88	58.92	4311	9
250.665451	25.19	42.33	14.71	56.58	4116	27
250.734711	21.61	40.82	35.25	65.58	4167	27
250.805435	22.32	52.30	27.79	70.09	4271	22
250.877121	26.33	44.70	27.19	63.69	4497	27
250.948776	37.21	45.65	26.34	69.99	4629	27
250.989899	42.06	48.00	15.02	70.95	915	27
251.026947	34.75	44.37	39.26	75.51	3461	15
251.090225	37.35	48.00	30.27	76.53	4018	15
251.161026	33.81	43.73	25.89	68.31	4088	12
251.231140	36.11	39.25	37.67	72.39	4232	12
251.301041	32.83	37.81	26.26	63.05	4365	15
251.371292	24.64	38.69	23.70	58.23	4426	15
251.441879	21.38	38.19	15.87	52.47	4327	12
251.512848	23.28	40.76	22.24	58.64	4288	12
251.584900	25.86	49.06	26.87	67.77	4335	12
251.655838	24.72	48.68	19.84	63.86	4140	18
251.725098	20.76	49.08	25.50	64.70	4128	18
251.795776	26.22	47.45	21.19	64.30	4266	18
251.867264	27.04	48.04	32.55	69.36	4474	18
251.938965	32.00	51.94	29.37	77.63	4607	18
251.986465	33.38	58.50	37.61	86.01	1493	18
252.020950	36.73	47.29	19.29	71.89	2853	15
252.078812	34.17	51.99	21.07	72.89	4131	15
252.150421	34.62	44.60	20.29	67.15	4076	7
252.220657	33.35	39.14	23.70	64.11	4213	7
252.290558	33.18	35.82	20.54	59.22	4337	12
252.360748	25.46	34.44	20.82	53.78	4431	12
252.431229	19.28	42.29	21.38	55.98	4364	22
252.501862	15.96	44.45	26.31	61.96	4249	22
252.574219	23.37	57.64	31.55	78.02	4357	22
252.645157	22.37	51.35	23.26	66.31	4158	22
252.714600	19.21	50.55	23.41	64.12	4070	22
252.785110	22.20	45.60	29.14	66.25	4271	15
252.856476	25.39	49.45	27.04	68.08	4383	15
252.928360	32.55	51.68	33.36	77.78	4598	22
252.982773	34.52	55.42	37.43	83.57	2401	22
253.017761	34.45	43.18	24.17	67.70	2040	9
253.068741	33.05	51.25	26.48	73.69	4188	9
253.140671	33.50	46.44	29.13	71.99	4052	7
253.211151	32.87	40.69	26.09	64.94	4184	7
253.280975	32.89	40.37	15.18	59.71	4318	6
253.351151	23.01	37.62	16.99	52.99	4413	6
253.421585	17.45	35.80	18.15	48.71	4395	5
253.492279	20.35	33.31	24.88	52.99	4265	5
253.564621	23.65	43.77	19.31	59.38	4324	7
253.635559	22.06	48.63	17.59	61.05	4189	4
253.705292	17.51	45.36	18.79	55.87	3988	4
253.775482	24.72	43.02	25.07	61.48	4253	2
253.846512	24.34	40.85	25.05	59.66	4297	2
253.918304	29.86	43.85	28.59	67.66	4526	0
253.977219	30.34	47.90	31.29	71.85	2882	0

254.013153	40.09	32.34	9.72	55.45	1516	0
254.058929	32.85	46.26	25.88	69.77	4231	0
254.131119	34.12	46.68	27.02	71.53	4035	2
254.201584	32.42	40.38	23.94	63.14	4164	2
254.271439	33.21	37.90	14.93	57.46	4310	3
254.341476	23.47	38.10	16.58	53.00	4386	3
254.411987	17.20	36.71	17.71	48.34	4407	6
254.482620	18.29	33.38	25.90	52.53	4281	6
254.554749	23.78	43.65	18.70	59.21	4365	4
254.625961	23.49	47.23	19.63	61.25	4226	5
254.695908	16.30	43.92	18.75	53.85	3923	5
254.765869	21.78	42.86	26.25	60.17	4229	6
254.836823	22.94	41.37	24.88	59.82	4281	6
254.908585	29.49	47.30	29.11	69.14	4512	5
254.970093	31.43	45.86	28.88	70.90	3338	5
255.006607	37.06	29.42	9.19	51.23	1129	0
255.049149	32.89	46.37	28.50	71.59	4248	0
255.121536	33.46	46.16	27.04	71.36	4028	0
255.192078	30.53	40.53	24.77	63.36	4139	0
255.261917	30.04	38.47	15.66	56.13	4293	2
255.331894	23.28	37.60	17.17	52.51	4374	2
255.402298	17.25	37.14	15.30	47.86	4398	4
255.472992	19.59	36.36	17.07	50.19	4300	4
255.544952	23.16	42.93	16.30	56.91	4374	5
255.616287	23.40	45.92	17.54	59.16	4261	5
255.686584	17.65	44.49	17.81	54.60	3998	9
255.756149	20.93	44.71	27.44	62.18	4219	5
255.827133	20.54	46.73	27.94	63.29	4276	5
255.898880	27.25	44.58	30.73	67.25	4514	6
255.967407	32.70	44.59	29.09	69.83	4201	6
256.001404	42.95	37.07	19.65	60.64	235	7
256.038300	35.01	51.89	29.74	77.92	4253	7
256.110748	37.91	48.21	32.75	78.28	4020	7
256.181519	30.14	53.05	42.80	83.32	4121	18
256.251434	32.89	38.45	21.84	59.97	4275	12
256.321350	26.85	39.56	14.79	55.66	4352	12
256.391785	19.44	39.18	23.25	54.34	4412	27
256.462402	16.06	43.48	30.02	62.78	4325	27
256.534180	22.03	62.82	38.56	88.77	4378	32
256.605652	22.57	61.56	38.00	87.56	4286	32
256.676270	20.85	62.03	28.17	82.61	4077	15
256.745636	24.69	71.66	36.25	97.66	4187	15
256.816437	25.80	71.40	37.50	99.94	4279	32
256.888336	29.56	61.57	45.82	95.31	4523	27
256.959839	36.66	52.92	26.83	77.70	4627	27
256.997162	22.37	63.47	14.79	73.02	423	27
257.034058	44.26	66.20	44.08	100.78	3816	27
257.101135	50.37	57.79	45.03	98.41	4032	27
257.171906	41.56	50.73	47.64	89.28	4105	22
257.241913	44.38	44.80	30.10	75.14	4260	22
257.311920	38.65	42.30	16.94	65.27	4394	6
257.382202	32.25	35.67	21.14	58.19	4425	3
257.452820	25.77	35.02	22.30	55.51	4300	3
257.524231	30.00	46.44	20.21	65.69	4348	5
257.595947	27.73	52.29	17.16	67.60	4306	5
257.666718	28.25	48.36	16.16	64.38	4111	5
257.736237	20.82	39.61	24.25	57.26	4136	5
257.806702	25.95	39.73	25.80	60.85	4266	4
257.878540	32.41	41.15	32.16	68.09	4484	6
257.950104	40.46	45.25	30.11	73.84	4623	6
257.991180	38.16	50.62	30.51	73.52	928	6
258.028351	47.01	44.28	26.81	77.93	3448	4
258.091492	46.17	51.08	32.48	83.95	4021	4
258.162323	39.22	47.81	31.11	76.09	4096	7
258.232391	41.85	42.96	26.68	71.39	4237	7
258.302338	37.16	41.93	18.61	64.15	4372	6
258.372589	29.52	37.44	19.07	56.31	4428	6
258.443146	24.76	36.11	18.56	53.41	4333	3
258.514221	24.75	41.61	22.83	60.17	4285	3
258.586243	26.49	50.20	17.99	66.30	4334	3
258.657166	25.74	48.42	19.43	65.02	4154	4

258.726410	18.83	43.53	25.24	58.94	4141	4
258.797089	21.92	45.14	26.88	62.16	4278	4
258.868591	25.37	43.59	28.64	63.15	4484	4
258.940338	33.97	46.41	28.80	70.22	4611	4
258.986633	31.80	52.63	39.97	77.66	1389	4
259.021851	36.50	43.49	22.86	68.65	3027	2
259.081329	37.10	48.53	31.43	77.13	4101	2
259.152710	32.51	45.96	27.62	70.43	4083	12
259.222992	30.14	39.26	18.39	57.66	4204	12
259.292755	29.61	40.46	13.05	56.54	4349	3
259.363007	21.53	37.13	17.88	50.94	4433	3
259.433533	17.52	35.83	14.58	46.03	4351	4
259.504181	20.58	35.74	19.04	51.13	4237	4
259.576538	24.57	45.67	17.05	59.67	4350	4
259.647461	22.66	45.34	14.89	57.52	4166	6
259.716888	18.72	42.98	18.78	54.44	4096	6
259.787415	23.32	42.89	24.43	59.76	4266	18
259.858795	22.88	47.00	29.52	67.05	4405	18
259.930603	31.09	51.96	40.76	83.44	4606	48
259.983734	34.15	61.11	39.72	93.10	2220	48
260.018097	30.51	55.71	34.49	84.49	2154	22
260.070129	31.30	58.41	35.78	86.72	4181	22
260.141998	29.63	48.61	31.64	72.44	4059	15
260.212372	29.57	39.54	25.54	61.97	4182	15
260.282288	29.51	37.25	14.11	55.04	4335	12
260.352417	18.92	36.93	18.75	50.36	4412	12
260.422943	14.43	39.91	17.92	49.54	4377	18
260.493561	17.84	34.80	27.79	54.11	4263	18
260.565826	23.02	50.41	31.08	71.66	4374	15
260.636841	21.25	52.75	25.07	67.24	4181	22
260.706451	20.98	49.85	26.78	67.83	4023	22
260.776855	23.62	58.23	35.42	78.99	4239	32
260.847778	22.77	46.65	35.83	70.66	4302	32
260.919708	33.94	88.98	82.45	145.18	4534	94
260.978119	36.49	71.43	45.49	103.35	2948	94
261.014648	46.64	67.01	41.66	101.67	1503	39
261.060303	30.71	64.72	33.48	88.09	4215	39
261.132294	35.79	52.89	37.13	82.27	4038	27
261.202789	33.71	41.69	27.11	67.45	4158	27
261.272919	36.70	43.04	18.36	63.92	4188	9
261.342773	23.26	40.43	19.45	56.97	4288	9
261.413269	18.15	38.73	18.50	52.60	4298	15
261.483887	19.35	40.00	25.56	59.03	4180	15
261.556030	26.61	62.62	41.43	88.44	4279	27
261.627228	22.72	49.06	28.66	67.66	4121	39
261.697235	17.09	41.98	17.46	52.41	3825	39
261.767181	24.46	58.48	28.60	75.39	4125	56
261.838104	24.44	56.39	42.55	88.26	4192	56
261.909912	51.75	238.50	177.88	328.72	4417	236
261.970673	68.63	171.16	69.88	216.53	3173	236
262.007477	73.97	340.01	84.27	374.00	1187	179
262.050629	50.28	162.67	56.57	199.87	4219	179
262.122803	44.44	113.59	37.30	138.42	4035	179
262.193298	37.09	88.71	45.47	116.58	4143	67
262.263214	41.85	77.70	40.30	109.01	4297	48
262.333191	32.30	64.14	34.87	91.41	4377	48
262.546295	24.77	75.60	28.21	90.43	4381	80
262.617676	26.57	76.90	52.47	107.88	4237	80
262.687927	22.65	69.45	19.11	87.58	4000	80
262.757507	30.96	73.44	27.13	97.30	4219	15
262.828491	30.99	67.34	31.94	94.89	4271	15
262.900208	34.22	60.45	31.70	88.91	4513	15
262.967773	39.52	61.47	29.03	87.68	4070	15
263.002441	43.12	104.80	22.12	115.95	414	15
263.040680	36.65	60.40	28.21	84.98	4256	15
263.113159	36.36	57.81	34.82	84.73	4025	15
263.183807	31.66	50.98	35.79	78.36	4119	15
263.253693	37.37	41.77	24.85	68.16	4282	15
263.323517	27.87	38.50	14.80	55.37	4347	15
263.394043	18.69	44.14	29.48	62.10	4413	48
263.464600	15.47	53.71	50.11	83.52	4306	48

263.536530	24.86	89.37	60.75	120.98	4384	80
263.607941	24.25	78.57	35.41	100.14	4274	80
263.678558	21.68	65.19	15.04	80.15	4071	27
263.747833	25.94	56.84	27.31	81.47	4198	27
263.818756	28.13	54.66	25.10	77.80	4287	15
263.890564	34.17	54.75	38.92	86.52	4519	22
263.962097	38.81	61.46	39.11	93.97	4637	22
263.998260	21.82	87.50	20.05	95.00	295	22
264.034302	39.68	56.68	38.23	91.70	3906	22
264.102478	34.90	58.97	32.46	83.23	4029	22
264.173157	30.94	53.30	42.88	83.88	4108	22
264.243225	35.78	39.95	26.47	66.92	4271	22
264.313232	29.90	40.23	17.11	59.38	4388	4
264.383484	21.33	37.57	20.21	54.97	4420	12
264.454132	19.25	40.36	18.65	54.05	4311	12
264.525635	21.61	51.29	30.36	71.37	4341	18
264.597290	22.77	54.79	19.54	69.94	4317	18
264.667999	19.84	53.69	16.56	64.71	4110	7
264.734955	23.31	50.27	27.34	69.91	3877	7
264.807434	29.21	46.37	25.11	68.05	4035	6
264.879913	34.72	43.54	29.92	70.83	4485	6
264.951447	43.43	48.50	30.15	78.80	4624	6
264.991272	35.77	46.17	22.93	68.84	806	6
265.028687	46.44	45.04	30.04	78.59	3556	7
265.092773	44.91	50.59	33.25	83.18	4020	7
265.163483	39.29	49.64	34.87	78.67	4083	12
265.233734	43.09	44.55	29.92	73.90	4244	12
265.303650	38.73	40.19	15.61	62.76	4378	7
265.373901	30.06	44.25	27.59	65.56	4429	7
265.444489	22.40	38.15	21.94	54.71	4321	15
265.515503	25.22	45.63	24.08	64.16	4293	12
265.587524	26.98	54.74	20.49	71.15	4332	12
265.658417	27.75	49.47	16.71	66.30	4151	6
265.727661	21.57	45.14	23.49	61.71	4157	6
265.798401	25.50	42.76	30.86	66.47	4274	7
265.869873	30.52	40.63	28.86	65.43	4510	7
265.941650	39.38	43.26	31.17	73.99	4623	6
265.986755	40.57	51.67	44.75	85.09	1268	6
266.022369	41.17	44.69	31.89	76.20	3146	12
266.074615	36.76	50.58	45.06	85.25	3178	12
266.153992	37.66	47.17	32.32	75.58	4085	9
266.224213	37.63	41.70	30.97	69.51	4215	9
266.294006	35.80	40.52	16.60	61.62	4344	6
266.364288	27.04	35.39	19.55	53.74	4420	6
266.514404	21.38	31.55	30.05	55.65	3237	6
266.577820	24.73	48.98	19.78	65.41	4347	6
266.648773	24.00	48.00	18.65	63.30	4168	5
266.718140	21.00	43.84	19.67	57.25	4107	5
266.788727	24.44	44.75	25.13	63.76	4263	6
266.860138	27.45	40.95	24.72	62.69	4421	6
266.931793	36.86	43.39	29.16	71.34	4565	3
266.984222	39.91	45.39	34.16	77.84	2107	3
267.018890	33.84	36.93	23.71	64.04	2332	7
267.072540	39.61	49.76	37.12	81.59	4168	7
267.144379	35.13	52.21	35.59	79.01	4069	15
267.214722	36.58	39.81	30.17	68.03	4196	15
267.284485	35.78	40.40	16.62	61.66	4320	6
267.354675	25.55	35.84	17.26	52.54	4417	6
267.425171	20.10	34.70	20.45	50.43	4375	4
267.495850	22.09	34.95	29.21	59.14	4263	4
267.568115	23.64	46.62	20.05	62.08	4372	6
267.639130	23.42	47.24	18.17	61.42	4184	6
267.708679	19.24	43.33	21.29	57.02	4055	6
267.779144	23.03	41.16	25.25	60.25	4241	5
267.850098	22.91	40.80	21.65	58.56	4311	5
267.922028	30.10	44.60	26.34	67.37	4551	4
267.980286	30.74	49.34	33.11	74.91	2938	4
268.016113	35.58	31.10	10.52	51.72	1487	2
268.061554	31.01	46.30	29.29	70.82	4209	2
268.133698	28.81	45.67	27.55	68.67	4054	5
268.204193	29.92	41.30	25.20	63.63	4176	5

268.274048	31.98	38.32	15.58	57.79	4320	3
268.344116	22.31	37.28	18.03	52.80	4398	3
268.414581	17.19	35.29	16.81	46.99	4386	4
268.485260	20.26	36.02	23.59	54.11	4282	4
268.557373	23.14	42.99	17.20	57.72	4372	5
268.628448	21.96	47.58	16.66	59.87	4211	15
268.698425	17.04	43.03	21.94	55.33	3912	15
268.768463	24.05	47.93	22.36	64.56	4231	48
268.839417	24.09	56.03	45.47	88.12	4294	48
268.911285	28.61	57.77	42.78	89.04	4530	18
268.972046	34.74	59.50	39.96	89.55	3254	18
269.008881	27.59	38.17	18.46	54.97	1211	12
269.051788	29.65	55.04	37.83	81.97	4239	12
269.124146	30.05	48.99	34.26	75.64	4015	12
269.194641	29.83	42.40	30.93	68.40	4144	12
269.270905	31.35	37.68	29.74	65.61	3530	15
269.325592	24.63	39.02	30.27	62.03	3366	15
269.405029	16.89	45.24	24.13	58.77	4395	18
269.475555	19.99	38.99	26.78	57.00	4287	18
269.547668	22.51	45.36	19.18	60.69	4370	18
269.618927	25.28	53.24	34.37	78.64	4251	18
269.689117	19.92	54.46	34.50	76.87	3989	27
269.758820	27.17	71.96	35.79	94.31	4218	22
269.829773	23.54	59.41	32.84	80.31	4280	22
269.901550	31.93	64.27	51.34	99.04	4516	27
269.968109	39.08	53.53	48.03	94.84	3940	27
270.003082	47.46	69.54	26.92	89.99	525	39
270.041992	35.87	65.62	47.96	102.05	4256	39
270.114441	36.74	59.32	48.36	95.82	4026	39
270.184906	32.48	48.41	31.34	72.93	4050	27
270.255096	36.86	49.51	34.26	77.76	4283	22
270.323090	31.83	45.70	20.70	64.75	4138	22
270.395355	19.22	43.38	32.82	64.28	4412	22
270.465912	19.61	42.52	28.81	62.17	4311	22
270.537842	23.41	48.56	25.98	67.32	4381	32
270.609222	25.74	58.83	39.66	88.70	4279	32
270.679840	22.40	53.53	25.25	71.37	4062	15
270.749237	20.26	52.87	31.00	73.76	4201	15
270.820038	25.61	53.42	33.66	77.94	4265	15
270.891846	30.41	53.41	33.76	78.60	4513	18
270.963440	37.19	52.88	35.13	81.48	4622	18
270.998932	20.54	89.42	11.84	92.90	177	18
271.035095	39.26	55.13	32.00	83.53	4059	12
271.104828	36.88	49.91	35.31	79.37	4026	12
271.175507	32.40	47.85	31.93	73.39	4109	12
271.245544	35.88	46.85	35.74	75.37	4260	12
271.315369	31.23	40.61	19.36	60.36	4370	18
271.385742	22.99	37.87	21.53	55.45	4421	12
271.456360	18.39	35.74	26.11	54.14	4322	12
271.527954	24.04	42.25	29.61	64.10	4354	9
271.599548	25.68	52.25	28.18	71.98	4303	9
271.670288	21.02	48.55	19.46	61.66	4105	9
271.739655	19.07	46.90	28.53	63.36	4169	9
271.810455	24.98	45.32	30.07	66.50	4268	7
271.882263	27.45	48.97	38.09	74.50	4481	12
271.953735	35.20	51.32	34.86	81.39	4611	12
271.992188	23.55	44.75	24.91	61.65	671	12
272.029480	38.67	48.28	36.24	81.72	3621	9
272.094086	34.81	51.53	38.00	81.18	4018	9
272.164917	31.86	49.48	38.81	79.84	4093	22
272.235077	33.69	39.79	26.80	63.58	4231	22
272.304932	30.13	38.81	17.01	57.11	4373	6
272.375153	20.52	36.01	25.47	54.37	4415	18
272.445831	16.69	36.38	23.76	52.17	4332	18
272.516907	19.32	43.92	29.45	64.75	4304	18
272.588898	23.27	57.79	35.09	80.91	4339	18
272.659851	27.63	53.21	27.43	73.38	3656	12
272.728973	22.66	46.10	26.57	65.51	4160	12
272.799713	25.92	43.49	29.57	66.73	4272	4
272.871277	33.24	40.63	31.52	68.46	4502	4
272.943054	42.37	47.83	29.42	76.05	4619	3

272.986816	43.91	54.16	36.70	83.06	1136	3
273.022858	43.97	43.29	25.74	74.55	3261	7
273.084198	43.53	49.98	33.77	82.30	4049	7
273.155304	40.26	47.67	34.03	78.23	4089	9
273.225525	40.52	39.27	26.63	68.25	4220	9
273.295258	38.59	38.88	15.25	61.77	4315	3
273.365723	29.92	36.76	20.95	57.25	4407	3
273.436157	23.12	35.82	22.49	53.60	4349	9
273.506805	24.16	39.55	27.91	60.79	4234	7
273.579132	26.74	54.44	27.69	74.54	4342	7
273.650116	26.20	50.45	27.38	70.43	4163	6
273.719452	22.00	46.58	22.86	63.26	4115	6
273.790070	25.74	45.26	26.72	65.98	4259	6
273.861511	29.77	45.73	27.28	69.32	4427	6
273.933167	39.52	49.98	27.91	76.34	4589	6
273.984619	44.51	48.89	31.72	83.16	1991	6
274.019348	39.43	49.78	35.97	79.31	2437	18
274.073883	41.64	57.99	44.17	93.53	4158	18
274.145691	36.69	55.86	41.58	85.82	4071	27
274.216034	37.98	45.87	37.07	76.38	4203	27
274.285797	40.02	62.38	44.12	94.31	4332	56
274.356018	29.38	57.31	40.33	85.87	4418	56
274.426483	18.87	54.01	38.87	77.40	4367	48
274.497162	17.22	68.25	57.76	99.34	4258	48
274.569458	25.21	75.68	45.36	103.99	4374	67
274.640411	23.25	70.53	36.07	93.19	4173	48
274.709961	23.51	63.67	25.18	83.34	4073	48
274.780365	24.86	51.07	21.11	68.95	4250	48
274.851562	30.64	77.72	53.85	115.55	4344	48
274.923401	44.52	84.17	64.06	130.36	4562	94
274.980835	40.39	69.50	31.55	95.42	2815	94
275.016876	48.48	38.84	16.23	71.04	1636	27
275.063965	39.60	54.49	26.37	80.11	4220	27
275.136047	35.83	55.18	34.31	81.43	4053	22
275.206482	39.23	46.24	31.78	75.23	4180	22
275.276306	40.88	43.66	27.03	71.17	4319	18
275.346405	28.57	44.24	22.95	63.47	4394	18
275.416901	21.60	41.70	24.68	59.17	4384	7
275.487549	22.27	45.85	32.01	66.34	4269	7
275.559723	25.87	51.36	26.90	71.13	4374	6
275.630798	25.00	53.58	21.80	70.89	4209	12
275.700867	19.19	48.86	24.10	62.75	3937	12
275.770752	22.31	45.64	29.14	65.61	4234	6
275.841766	26.66	44.15	25.07	63.59	4289	6
275.913574	36.55	42.06	30.54	71.28	4517	4
275.973969	40.22	43.41	31.16	75.53	3210	4
276.010345	37.26	32.30	8.92	53.87	1200	2
276.053101	39.81	48.68	28.54	76.92	4235	2
276.125427	38.70	47.65	29.53	75.52	4036	4
276.195923	37.27	42.51	23.91	68.00	4149	4
276.265839	37.64	39.82	18.00	62.42	4309	5
276.335846	26.77	41.38	22.87	60.72	4378	5
276.406342	20.17	36.26	25.68	53.45	4397	6
276.476898	19.38	35.30	30.18	57.88	4291	6
276.548981	22.80	45.94	29.04	66.58	4389	9
276.620239	24.22	55.09	29.11	73.05	4242	9
276.690369	21.66	56.59	43.59	88.03	3969	32
276.760132	22.54	50.75	30.14	72.75	4226	9
276.831116	25.26	49.72	27.96	70.24	4286	9
276.902893	33.71	54.67	36.32	82.15	4519	12
276.968536	40.46	50.93	41.76	88.52	3828	12
278.035309	45.18	49.30	30.64	83.01	4182	32
278.106140	42.66	53.48	32.75	83.77	4021	32
278.176819	37.18	50.12	33.74	77.82	4115	39
278.246887	38.02	46.53	32.23	75.03	4256	39
278.316711	30.95	56.98	44.16	88.54	4362	48
278.387146	26.06	64.81	40.87	89.03	4408	27
278.457703	18.82	64.57	37.54	86.75	4319	27
278.529327	25.21	84.52	55.79	118.56	4359	56
278.600861	28.84	104.64	80.14	158.75	4300	56
278.671631	34.98	112.37	54.69	147.13	4110	27

278.740936	38.76	139.89	65.36	178.34	4180	27
278.811707	44.37	142.81	71.23	187.20	4277	5
278.883575	47.32	108.60	86.63	172.59	4499	7
278.955109	56.01	103.09	61.07	149.30	4621	7
278.993622	48.43	115.20	23.10	137.03	687	7
279.031219	57.65	103.01	47.58	142.34	3653	7
279.096466	52.37	96.32	51.05	134.12	4021	7
279.167297	43.58	92.37	72.13	140.38	4095	18
279.235260	58.72	138.45	109.06	201.35	3828	18
279.307251	48.19	133.21	78.75	173.81	4380	48
279.377533	41.06	106.54	45.92	131.29	4419	48
279.448120	28.01	86.16	34.45	105.85	4331	48
279.517731	36.61	146.52	87.81	191.25	4102	94
279.591888	47.44	160.40	80.21	201.88	4240	94
279.662048	57.26	127.39	57.74	166.18	4140	67
279.731323	53.60	121.03	45.34	152.53	4154	67
279.802002	55.25	112.58	31.95	145.04	4284	154
279.873901	57.05	115.36	53.65	155.83	4432	154
279.945282	57.98	92.07	47.27	131.58	4623	67
279.986359	69.21	76.07	18.58	118.92	917	67
280.023407	51.14	82.56	41.85	115.86	3376	56
280.085663	49.79	79.48	35.47	110.16	4026	56
280.156647	45.83	68.63	29.81	96.89	4096	111
280.226807	48.41	59.99	28.66	91.22	4217	111
280.294861	48.20	53.14	22.99	82.20	4134	179
280.367096	36.54	52.15	24.43	76.92	4405	179
280.437561	27.66	53.46	25.01	71.95	4350	154
280.508331	26.00	52.66	30.62	72.97	4195	179
280.580475	27.80	62.17	20.94	78.80	4343	179
280.651428	28.51	59.35	16.50	74.58	4165	111
280.720764	28.03	56.06	18.51	74.64	4115	111
280.791351	31.69	52.74	23.29	75.18	4269	94
280.862915	37.64	48.87	19.64	72.90	4443	94
280.934540	46.25	47.65	25.64	78.76	4603	48
280.985046	48.30	43.00	29.21	80.21	1870	48
281.019348	43.55	49.42	25.88	77.85	2498	12
281.075165	45.43	55.33	31.06	85.42	4137	12
281.147003	41.97	55.83	29.57	82.18	4066	3
281.217346	40.08	47.30	28.66	75.09	4204	3
281.287170	42.35	46.78	18.47	71.05	4344	3
281.357330	30.88	39.13	20.89	60.31	4418	3
281.427795	22.29	38.66	23.42	56.45	4364	2
281.498505	22.49	42.35	33.27	65.98	4257	2
281.570801	25.71	60.23	29.19	78.95	4365	4
281.641785	25.20	55.99	22.52	71.84	4185	2
281.711243	23.93	49.56	24.26	68.13	4088	2
281.781738	27.16	47.46	28.64	70.81	4256	4
281.852600	30.19	45.22	27.98	69.48	4292	4
281.924805	39.42	44.35	29.81	74.64	4583	3
281.981384	40.33	49.67	35.03	81.87	2698	3
282.017059	42.30	33.94	14.70	61.17	1749	0
282.065277	41.34	52.74	31.43	80.66	4214	0
282.137360	40.25	51.54	31.97	80.09	4052	4
282.207794	36.57	42.02	27.94	68.71	4186	4
282.277649	39.38	38.41	16.53	62.64	4323	5
282.347717	27.28	36.70	18.60	56.01	4401	5
282.418213	22.20	34.09	19.57	51.72	4379	4
282.488861	21.86	35.63	24.45	56.05	4254	4
282.561096	24.36	46.89	20.71	63.45	4388	9
282.632202	23.49	49.98	21.61	65.69	4214	6
282.702423	18.51	43.55	16.06	54.10	3913	6
282.772003	22.65	41.62	22.59	59.94	4221	6
282.843140	25.55	42.48	22.23	60.58	4300	6
282.915131	35.66	45.62	32.96	74.58	4480	0
282.975677	39.95	50.50	37.26	82.34	3153	0
283.012085	38.92	35.20	9.00	57.21	1252	0
283.055969	39.35	50.13	26.36	75.21	4176	0
283.127869	36.38	47.71	25.67	71.82	4030	2
283.198273	34.95	40.43	25.86	65.68	4160	2
283.268158	37.60	38.41	18.98	61.75	4318	2
283.338104	25.96	36.01	20.16	55.36	4384	2

283.408600	21.16	34.36	19.82	50.27	4391	2
283.479248	20.31	32.90	26.06	54.34	4287	2
283.551300	23.39	45.74	21.45	62.70	4390	2
283.622528	23.22	49.76	22.47	65.07	4245	2
283.692688	19.32	43.95	21.51	57.58	3960	2
283.762451	23.00	41.97	25.37	61.71	4225	3
283.833435	24.30	40.82	22.88	60.34	4290	3
283.905151	29.84	44.67	27.80	67.00	4522	7
283.969452	33.65	48.64	32.28	73.96	3637	7
284.004517	40.92	33.61	15.18	58.89	773	3
284.044708	33.20	50.76	29.64	75.14	4256	3
284.117126	32.97	48.38	32.11	74.32	4019	3
284.187683	28.57	45.24	30.33	67.18	4125	2
284.257660	32.99	41.98	29.10	65.91	4277	2
284.327606	24.67	42.97	22.02	60.09	4365	2
284.398102	18.29	42.50	31.26	62.14	4402	2
284.468658	17.95	40.03	25.43	56.57	4302	2
284.540527	21.43	46.50	28.18	64.84	4383	4
284.611877	21.77	54.88	29.04	71.78	4265	4
284.682465	19.20	50.31	24.70	65.81	4062	4
284.751892	24.42	43.39	22.96	62.69	4204	6
284.823212	24.15	42.71	26.74	63.14	4222	6
284.894592	27.61	46.39	29.21	67.41	4514	7
284.965881	35.09	46.51	25.46	69.76	4524	7
285.035950	30.37	53.40	32.83	77.68	4234	7
285.107452	32.20	50.61	46.44	85.62	4019	7
285.178131	26.47	51.62	45.98	83.10	4116	9
285.248230	30.59	45.52	42.05	77.35	4264	9
285.317963	22.28	41.43	22.72	58.77	4353	15
285.388580	18.84	36.57	21.45	52.39	4415	9
285.459015	17.49	37.96	22.46	52.93	4327	9
285.530670	21.23	48.80	37.45	74.60	4360	6
285.602234	21.68	51.75	22.72	67.56	4300	6
285.672974	18.55	48.76	17.02	60.74	4110	7
285.742249	28.00	46.95	28.73	69.81	4187	7
285.813080	28.15	52.08	33.99	76.78	4276	4
285.884979	27.10	48.03	36.92	74.10	4493	7
285.955780	34.06	48.01	29.99	74.26	4535	7
285.995422	25.11	44.65	24.47	60.38	573	7
286.032745	40.52	47.87	35.35	81.54	3652	27
286.097839	39.14	47.57	34.04	78.10	4023	27
286.168518	33.22	47.12	31.06	71.92	4090	39
286.238983	37.12	39.86	25.25	64.39	4157	39
286.308594	31.31	39.35	18.51	59.03	4383	9
286.378876	23.38	36.72	22.04	54.45	4407	6
286.449463	19.67	34.65	24.50	52.75	4320	6
286.520538	23.51	39.75	26.73	60.43	4296	12
286.592560	24.72	49.80	26.00	68.73	4328	12
286.663391	21.39	47.66	22.75	62.99	4137	5
286.732635	19.81	42.28	24.12	58.37	4161	5
286.803375	23.63	41.62	26.88	61.01	4283	18
286.875031	27.12	41.08	32.41	65.49	4493	4
286.946655	36.83	47.13	31.14	75.62	4620	4
286.987762	38.38	60.73	37.26	84.28	925	4
287.024353	34.01	62.09	43.88	95.17	3408	9
287.087067	35.31	61.16	58.02	106.31	4022	9
287.157990	31.48	76.24	60.84	114.64	4099	4
287.298065	30.41	46.60	43.11	79.25	4364	4
287.368347	20.92	42.62	45.89	72.85	4416	4
287.438843	19.46	37.13	48.26	70.97	4342	5
287.509491	20.68	40.70	46.35	71.81	4228	6
287.581879	21.90	54.13	41.12	79.62	4351	6
287.652802	21.75	47.16	41.82	75.11	4160	4
287.722137	23.81	48.96	43.22	81.19	4126	4
287.792755	26.08	47.07	41.59	79.06	4266	4
287.864288	26.19	47.75	40.62	78.96	4452	4
287.935974	35.66	56.48	48.23	94.01	4604	15
287.985474	39.71	55.26	54.16	96.49	1750	15
288.020233	35.87	59.27	44.78	95.98	2680	80
288.076569	35.18	60.38	43.66	93.66	4132	80
288.148376	27.74	61.95	46.50	93.01	4072	111

288.288727	34.79	73.09	58.96	115.50	4315	15
288.358734	21.75	65.80	44.95	96.96	4407	15
288.429199	20.63	78.68	51.56	109.43	4373	9
288.499817	17.91	76.89	59.42	110.59	4245	9
288.572174	27.32	109.56	55.74	142.69	4362	27
288.643127	26.38	95.81	49.69	125.49	4180	27
288.712616	31.16	93.13	59.52	129.85	4090	27
288.783081	33.47	70.47	62.20	112.66	4241	15
288.854462	31.40	58.02	43.51	93.61	4374	15
288.926239	38.28	66.20	48.33	105.39	4598	6
288.981964	41.31	69.60	48.02	109.25	2590	6
289.017303	36.27	54.62	16.12	72.75	1867	22
289.066681	38.33	57.18	32.65	83.86	4215	22
289.138733	33.70	54.70	38.39	83.65	4056	39
289.209106	32.29	45.94	28.34	70.21	4179	39
289.279053	34.44	43.01	18.25	63.42	4336	67
289.349121	23.16	40.26	20.20	57.59	4394	67
289.419586	17.98	39.31	19.79	53.59	4379	48
289.490234	20.85	44.09	24.05	59.70	4259	48
289.562439	24.18	55.00	20.59	69.39	4377	48
289.633575	21.57	51.54	19.93	64.78	4216	56
289.703400	18.37	47.16	24.80	64.03	3979	56
289.773499	28.09	48.84	23.50	68.21	4238	32
289.844482	26.04	44.17	25.90	65.88	4291	32
289.916260	31.08	49.88	30.31	74.32	4527	48
289.975830	35.04	52.80	31.79	79.66	3079	48
290.012390	30.83	42.24	17.00	59.12	1359	7
290.056885	32.49	63.22	40.77	92.54	4238	7
290.129028	32.32	55.84	26.21	76.47	3451	15
290.199646	30.46	41.92	22.76	63.54	4151	15
290.269531	33.36	39.86	18.20	60.73	4302	6
290.339478	23.11	40.23	16.99	56.37	4388	6
290.409973	16.81	38.59	21.58	52.92	4392	6
290.480621	19.07	37.25	23.55	53.88	4283	6
290.552704	23.23	46.97	20.82	61.95	4391	7
290.623993	22.74	49.17	20.63	64.64	4244	7
290.694061	17.25	47.42	24.08	61.17	3958	6
290.763824	25.71	46.07	30.51	69.40	4225	7
290.834747	25.70	43.18	25.86	65.14	4293	7
290.910675	32.63	50.61	31.65	77.39	3992	7
290.969666	35.44	45.65	29.10	72.91	3524	7
291.005219	39.04	30.79	11.11	54.40	892	32
291.046082	35.62	52.48	32.72	78.82	4252	32
291.118530	35.19	51.72	45.27	84.49	4019	32
291.189087	30.26	45.35	28.58	67.25	4142	7
291.259094	33.67	37.95	20.44	59.38	4292	5
291.328949	25.50	38.25	18.02	54.85	4359	5
291.399384	19.13	34.00	22.54	51.01	4397	5
291.470001	18.34	33.90	23.64	51.90	4303	5
291.541931	22.12	46.48	23.21	63.07	4387	6
291.611542	24.52	51.31	21.92	66.57	3849	6
291.683838	30.98	45.75	18.19	64.38	4056	12
291.753204	23.37	40.32	25.11	60.00	4209	7
291.824158	26.62	39.42	38.08	71.26	4283	7
291.895935	36.40	41.31	33.92	74.53	4511	7
291.966217	41.57	47.46	30.78	77.95	4428	7
292.000336	47.89	68.89	17.93	85.96	57	15
292.036407	49.04	49.86	32.42	86.00	4313	15
292.108856	47.71	52.09	33.86	86.98	4020	15
292.179535	39.09	48.68	31.01	77.01	4121	15
292.249542	42.85	39.90	23.45	69.42	4268	15
292.319397	36.40	38.74	16.95	61.65	4352	7
292.389862	28.43	36.51	22.67	57.40	4422	7
292.460358	26.99	34.95	29.67	60.70	4320	7
292.532074	29.88	44.49	35.96	73.10	4363	7
292.603577	26.31	53.83	26.08	72.25	4294	7
292.674286	29.02	47.96	20.83	66.52	4107	7
292.743591	22.21	40.13	27.42	60.60	4192	7
292.814453	26.22	41.48	25.49	63.54	4274	15
292.886322	32.60	46.45	34.49	74.96	4492	12
292.957825	42.70	47.78	30.91	79.24	4633	12

292.996185	25.62	41.14	23.06	59.27	654	12
293.033752	48.58	50.92	28.99	84.35	3675	15
293.099182	45.39	53.56	33.85	86.32	4024	15
293.169952	36.14	48.53	28.40	73.34	4103	9
293.240082	40.64	41.10	20.04	66.80	4253	9
293.309937	35.32	41.83	17.93	63.76	4367	6
293.380280	28.07	36.81	19.63	55.67	4421	7
293.450836	21.85	36.50	21.50	53.92	4316	7
293.522064	23.57	42.79	27.53	63.69	4314	12
293.593994	24.79	52.25	22.34	68.84	4298	12
293.664764	26.12	48.59	21.63	66.73	4134	6
293.733978	21.65	41.70	25.60	59.95	4163	6
293.804749	25.11	42.07	26.11	62.77	4285	6
293.876465	24.76	38.34	31.40	61.94	4493	12
293.948059	32.91	41.25	25.56	65.60	4623	12
293.989136	42.96	46.16	35.73	79.33	925	12
294.026306	32.74	45.29	25.32	68.94	3466	12
294.089508	31.95	47.64	37.59	77.72	4018	12
294.160370	28.75	47.36	34.83	72.89	4089	12
294.300385	26.27	36.62	43.30	68.26	4360	9
294.370636	18.25	33.61	45.39	64.59	4417	9
294.441162	16.67	34.49	47.33	65.94	4341	7
294.511841	18.65	40.55	45.60	70.54	4226	15
294.584198	22.86	50.14	42.43	76.94	4341	15
294.655151	20.85	47.29	41.71	73.03	4155	5
294.724457	21.96	41.80	45.38	74.70	4145	5
294.795105	26.38	41.16	42.91	76.09	4267	5
294.866547	25.29	41.97	40.57	72.83	4447	5
294.938171	29.70	43.43	41.49	76.37	4587	7
294.986328	35.53	51.10	58.01	94.68	1573	7
295.020691	28.02	46.90	24.34	67.33	2796	3
295.078156	31.22	48.25	36.43	76.96	4126	3
295.149719	25.54	48.28	36.00	72.43	4076	4
295.289948	25.51	36.64	40.68	66.19	4348	2
295.360138	18.17	34.63	40.99	62.79	4413	2
295.430573	16.13	35.10	44.76	64.17	4368	3
295.501221	19.73	39.05	45.45	69.38	4252	2
295.573547	23.74	51.87	39.44	78.31	4361	2
295.644501	22.42	46.80	40.67	73.15	4179	3
295.713959	22.73	42.89	41.94	74.25	4088	3
295.784485	28.58	41.21	45.22	78.61	4257	4
295.855896	24.66	41.06	42.88	72.46	4380	4
295.927612	27.63	42.55	42.92	74.91	4597	2
295.982513	30.06	51.05	40.33	81.61	2475	2
296.017670	29.55	36.08	18.48	59.07	1978	2
296.068115	29.32	46.51	29.58	70.43	4202	2
296.140137	25.19	46.69	28.73	68.31	4058	0
296.210510	27.48	39.25	20.53	58.08	4185	0
296.280457	24.66	39.46	14.73	53.04	4331	2
296.350555	16.92	40.82	19.61	51.49	4392	2
296.420959	16.37	35.90	17.77	47.81	4374	3
296.491608	19.59	38.35	27.32	57.91	4254	3
296.563873	24.83	48.50	33.10	72.63	4381	6
296.634918	23.06	48.94	34.08	71.47	4214	5
296.704651	23.60	48.74	34.05	73.17	4003	5
296.774902	36.82	64.37	60.25	110.97	4226	4
296.845886	26.02	60.61	39.11	89.35	4295	4
296.916809	31.71	53.32	34.67	80.72	4370	2
296.975983	33.18	59.39	44.75	92.57	2932	2
297.012695	42.69	50.92	34.42	83.38	1485	3
297.058258	36.52	55.93	36.54	85.62	4234	3
297.130493	31.53	48.42	31.52	73.62	4031	3
297.201019	32.12	42.09	29.31	66.23	4143	3
297.270935	33.52	49.69	35.50	77.20	4313	7
297.340881	26.06	43.31	26.34	63.94	4377	7
297.411530	19.04	41.64	28.19	59.07	4354	15
297.481964	19.71	41.85	30.51	62.09	4280	15
297.554077	24.78	47.09	25.68	66.38	4384	18
297.625336	22.07	51.03	22.43	66.31	4247	39
297.695526	18.11	48.18	20.14	59.69	3936	39
297.765198	26.10	45.13	25.07	64.84	4229	32

297.836151	24.88	42.38	26.97	63.80	4288	32
297.907928	33.66	46.23	34.80	74.07	4524	12
297.970001	42.45	50.44	37.48	85.01	3404	12
298.005920	42.31	31.47	9.97	56.76	1008	27
298.047485	42.06	55.94	32.17	85.02	4247	27
298.119873	40.44	51.29	33.70	81.59	4012	27
298.190460	35.65	43.13	27.24	68.65	4136	18
298.260468	38.17	41.93	19.47	64.43	4296	22
298.330383	28.49	42.64	22.38	62.46	4364	22
298.400818	21.23	40.51	33.86	61.93	4402	22
298.471375	18.65	44.07	43.81	71.86	4294	22
298.543335	25.73	54.10	37.33	78.85	4387	9
298.614655	23.48	54.04	22.81	69.77	4266	9
298.685211	24.67	48.55	19.06	63.24	4047	6
298.754608	23.54	43.79	28.68	64.68	4211	7
298.825531	24.34	43.84	28.69	65.49	4284	7
298.897278	32.37	46.12	35.00	74.53	4520	9
298.966705	40.38	46.11	32.60	78.53	4302	9
299.001068	43.69	66.58	23.18	83.32	176	9
299.037720	42.93	51.42	35.12	85.36	4283	9
299.110260	40.47	51.05	42.08	87.30	4021	9
299.180908	33.79	44.88	36.19	75.03	4123	6
299.250946	37.00	40.38	43.10	77.24	4276	9
299.320740	29.38	41.69	39.62	72.75	4347	9
299.391235	22.49	36.82	45.67	70.17	4409	18
299.461761	17.47	39.83	43.35	69.81	4330	18
299.533508	25.90	50.16	52.37	85.13	4366	12
299.604980	25.74	53.01	45.59	84.05	4293	12
299.675690	24.67	47.02	37.43	74.73	4097	5
299.823395	26.11	44.80	30.08	70.45	3409	6
299.887787	29.22	43.36	45.35	79.93	4492	6
299.959167	38.60	48.22	45.11	86.57	4621	6
299.996857	23.08	44.05	74.25	98.30	532	6
300.033997	44.37	51.05	34.31	84.67	3770	2
300.100708	40.50	51.61	38.32	84.38	3933	2
300.171356	30.88	50.34	36.78	76.91	4109	3
300.241455	34.95	44.97	28.11	69.03	4250	3
300.311340	29.46	45.44	21.70	64.60	4370	7
300.381653	21.64	39.04	23.94	56.73	4419	7
300.452209	17.82	38.97	24.58	55.70	4312	7
300.523499	23.09	47.67	33.08	69.38	4326	12
300.595367	25.42	50.92	26.53	69.67	4331	12
300.666168	22.44	49.39	21.42	64.31	4133	4
300.735413	19.70	42.69	26.35	60.52	4171	4
300.806122	24.73	42.14	28.25	63.52	4282	6
300.877869	24.79	49.22	35.33	72.62	4498	7
300.949493	34.59	49.74	35.26	79.33	4628	7
300.990509	43.25	53.79	30.05	80.67	919	7
301.027649	33.80	47.92	32.48	75.93	3471	12
301.090912	37.04	49.81	31.24	78.72	4019	12
301.161774	40.47	56.85	31.32	86.17	4103	9
301.231934	51.52	83.50	57.68	131.99	4232	9
301.301849	136.51	195.01	43.79	261.85	4360	7
301.372070	67.47	89.18	41.21	139.24	4423	7
301.442566	20.29	42.70	42.29	74.21	4330	7
301.513245	23.10	45.10	33.23	67.75	4226	7
301.585663	26.71	53.07	19.96	69.57	4340	7
301.656586	23.63	50.14	18.94	64.76	4155	4
301.725830	23.10	46.90	19.78	62.33	4150	4
301.796234	25.62	49.52	13.60	63.92	3952	6
301.869049	31.91	47.95	13.43	66.18	4327	6
301.939697	38.55	47.71	13.99	70.27	4617	9
301.986694	34.64	68.89	24.91	88.07	1449	9
302.021240	46.82	42.57	23.88	75.03	2914	9
302.079529	44.38	53.73	25.41	82.16	4106	9
302.151123	39.12	52.69	24.70	78.61	4080	2
302.221527	37.81	46.11	26.39	73.78	4195	2
302.291351	35.45	47.98	16.09	67.56	4352	5
302.361511	25.25	45.24	17.29	60.77	4410	5
302.431976	22.06	48.96	18.08	61.42	4355	5
302.502625	22.93	37.32	22.07	56.13	4230	4

302.574951	28.28	53.68	28.68	73.24	4358	4
302.645844	26.12	48.41	22.50	66.76	4168	4
302.715302	26.56	46.15	22.10	63.91	4099	4
302.785858	25.89	48.81	27.37	68.60	4259	3
302.857361	24.10	52.52	19.96	67.46	4412	3
302.928986	34.03	64.29	17.53	81.83	4604	4
302.983063	42.24	89.13	29.59	114.69	2351	4
303.018005	37.09	118.12	65.88	151.20	2097	3
303.069580	44.13	111.86	59.54	149.83	4194	3
303.141479	37.59	100.55	52.38	129.50	4048	3
303.211884	36.72	71.62	50.03	103.35	4190	3
303.281860	36.72	75.39	42.41	102.85	4331	9
303.351898	26.80	76.74	32.03	95.75	4394	9
303.422363	20.85	75.43	43.57	99.24	4384	39
303.492950	21.78	72.97	23.49	86.93	4248	39
303.565247	28.62	66.69	34.59	92.35	4382	27
303.636292	27.09	72.59	38.63	98.21	4205	9
303.705994	30.19	75.24	26.32	96.80	4022	9
303.776245	31.04	70.40	36.19	95.64	4243	15
303.847290	28.47	62.50	31.90	84.02	4302	15
303.919006	36.51	64.73	23.58	84.47	4535	56
303.977386	37.74	67.15	17.77	85.72	2929	56
304.013794	41.62	52.32	51.52	95.90	1526	80
304.059662	40.81	69.54	24.87	90.15	4235	80
304.131927	38.41	57.24	29.07	83.41	4034	80
304.202362	37.93	49.63	27.78	74.49	4172	80
304.272308	39.68	46.67	26.55	73.62	4314	22
304.342316	27.26	50.34	20.86	67.01	4375	22
304.412750	22.24	53.12	25.50	69.63	4392	27
304.483368	21.55	47.57	19.46	60.21	4278	27
304.555481	22.85	56.78	27.69	74.31	4385	15
304.626740	21.57	61.34	26.39	76.79	4246	18
304.696808	16.27	51.22	18.97	62.02	3933	18
304.766571	26.22	47.56	27.72	70.03	4229	18
304.837616	27.12	45.25	27.70	68.66	4291	18
304.909424	33.18	48.29	36.00	78.80	4509	12
304.969879	38.04	51.73	40.93	86.61	3232	12

APPEBDIX F. FILES CONTAINING FRAME TIME ABNORMALITIES

NOTE: in this Section, the first minute of data in each BC data file is #1.

The BC files for Days 2000-248, 2000-249, 2000-251, 2000-265, 2000-292,and 2000-293 exhibit frame time abnormalities. This problem is not limited to data from DMSP F15. For example, it occurs in the F13 file for day 2000-197.

For example, in minute #154 of the BC file SSMF1500248 for Day 2000-248, the 36 bits 9408-9443 (enough for 4 9-bit raw words) of the data array DATAA in Subroutine UNPACK represent (in 1024ths of a second) the time of frame #32, giving a time of 9433514 1024ths of a second. However, in the following frame #33, the bits 9696-9731 produce the time of 9433100 1024ths of a second, which precedes the time for frame #32, when it should be about 1 second after the time of frame #32.

Moreover, the same quirk recurs later in minute #261. In frame #28, bits 8256-8291 produce 16003508 1024ths of a second. However, for the next frame (#29), bits 8544-8579 result in only 16003092 1024ths of a second, which precedes the time for frame #28, when it should follow the time of frame #29 by about 1 second.

Processing of Day 248 also repeated each of the following values of TS (time of second/frame). The minutes and seconds of each duplicate are also tabulated below. The second copy of each duplicated TS occurs 1 second after the first copy. In addition, since 1 second of data consists of 288 bits (32 9-bit raw words), the second copy always starts 288 bits after the first copy starts. For instance, in the first entry below, the bit range of the second copy is 10272-10307.

TS	1st copy		Bit range	1024ths of a second
	minute#	second#		
1114.50	19	34	9984-10019	1141246
1122.50	19	42	12288-12323	1149438
1143.50	20	03	1056-1091	1170942
1146.50	20	06	1920-1955	1174014
1151.50	20	11	3360-3395	1179134
1156.50	20	16	4800-4835	1184254
1167.50	20	27	7968-8003	1195518
1171.50	20	31	9120-9155	1199614
1202.50	21	02	768-803	1231358
1212.50	21	12	3648-3683	1241598
1215.50	21	15	4512-4547	1244670
1222.50	21	22	6528-6563	1251838
1226.50	21	26	7680-7715	1255934
1231.50	21	31	9120-9155	1261054
1234.50	21	34	9984-10019	1264126
1240.50	21	40	11712-11747	1270270

These duplicates are due to identical sets of bit values for the two bit ranges in each row above.

None of the remaining five days has duplicate data lines. Day 2000-249 contains two places where frame times are out of order, but the other four days have only one. Below is a table that summarizes the time backups of all six days. For the incidence, the error seconds are in the middle of minute blocks for Days 2000-248 and 2000-292, at the beginning for 2000-249, and at the end for the remaining days. For the second incidence, they are in the middle for Day 2000-248 and middle/end for Day 2000-249. The remaining days have no second incidence.

Day	2000-248	2000-249	2000-251	2000-265	2000-292	2000-293
Frame time out of order #1: pre-crossing						
minute	154	143	248	277	259	248
second	32	02	55	57	24	58
start of bit range	9408	768	16032	16608	7104	16896
seconds/1024	9433514	8726954	15232434	17016098	15876514	15235490
Frame time out of order #1: post-crossing						
minute	154	143	248	277	259	248
second	33	03	56	58	25	59
start of bit range	9696	1056	16320	16896	7392	17184
seconds/1024	9433100	8726632	15232354	17015850	15876200	15235360
position of error second (beginning, middle, or end of minute block)						
	middle	beginning	end	end	middle	end
Frame time out of order #2 (where applicable): pre-crossing						
minute	261	249				
second	28	41				
start of bit range	8256	12000				
seconds/1024	16003508	15279540				
Frame time out of order #2 (where applicable): post-crossing						
minute	261	249				
second	29	42				
start of bit range	8544	12288				
seconds/1024	16003092	15279220				
position of error second (beginning, middle, or end of minute block)						
	middle	middle/end				

APPENDIX G. DMSP ORBITAL ELEMENT VALIDATION

[This appendix was written by M. Kendra, of Radex, Inc.]

Quality assessment of DMSP orbital elements, identification of error sources, and estimates of the magnitude of orbit propagation errors are described. This effort relied on the orbital elements, and the propagation of orbital motion using extrapolation (SGP4) or interpolation (LOKANGL) software for ephemeris construction. The absolute accuracy of the ephemerides could not be determined from these techniques, and thus the results and conclusions described herein refer only to the relative quality and accuracy of the elements and their propagation software.

Data Description

Orbital elements were obtained from USSPACECOM for DMSP satellites F10 through F14 for 1999. These were in standard mean Keplerian format, commonly referred to as two-line element or TLE. Time resolution was approximately 8 hours for all satellites, with some occasional gaps. A cursory evaluation indicated that these gaps were not significant, usually smaller than 24 hours. The worst case was for F14, which was populated in 1044 of the 1095 available (8 hour) time slots.

Orbital elements for DMSP F15 were obtained for 2000, days 4 –132. Days 4-61 were at 8 hour resolution, and the remainder at one day resolution.

Data Quality of the Orbital Elements

All data were checked to ensure the elements were monotonic in time and that the correct satellite identification number appeared on each line. An initial continuity and quality assessment was then made by examining time series plots of each of the Keplerian parameters. In general, these plots indicated that the parameter was continuous and piecewise smooth. There were several cases when one or more parameter exhibited an abrupt change. An example of one such change is given in Figure 1, where the mean anomaly and argument of perigee for F10 appear to be anomalous from 31 July through 2 August. Figure 2 shows a second example, where the orbital inclination for F15 appears to change in steps on 7 March and again on 17 April.

These anomalies were investigated with respect to ephemeris generation discrepancies as described in subsequent sections, and no clear correlation was found. They remain as error source candidates, however, because a definitive quality test could not be constructed for them.

Test Ephemeris Generation

Test ephemerides were generated using the SGP4 orbit propagator and the LOKANGL orbit propagator in interpolation mode. Two approaches were taken for the incremental time steps

used over the study period. In the first approach, a fixed time step of one hour was used. This allowed generation of ephemerides from all TLEs, or from subsets of TLEs over a study interval, and comparison the results. In the second approach, the time interval between adjacent TLEs, Δt, was used to generate pairs of test ephemerides. The first state vector of each pair was computed using the current TLE with a propagation time step of zero. The second state vector of the pair was computed using the previous TLE with a propagation time step of Δt, the time between the element set pair. This allowed comparison of the propagated and non-propagated state vector products.

In generating these test ephemerides, there was some concern that the single precision computations used by SGP4 might introduce some round off error which would bias the results. Results from a double precision version of SGP4 are compared to single precision results in Figure 3. Differences were generally within 50 meters, with a small negative bias. Although this is a relatively small and unimportant error source, prudence was exercised by using double precision ephemerides for all test cases. LOKANGL was already a double precision program.

Data Quality of the Test Ephemeris

Position differences were expressed as either the total position error or as its component in the direction of the spacecraft velocity vector, the in-track error (ITE). An example of the in-track error computed by SGP4 using time steps of the TLEs is shown for F15 in Figure 4. The error is generally within 0.5 km through 1 March, after which it becomes as large as 2 km. This abrupt change may be attributed the TLE interval changing from 8 hours to 24 hours, as described earlier. The long term trends, from a few days to several weeks, are real. When the TLE drag term (ndot/2) is compared to computed values from the TLEs ($\Delta n/\Delta t$), as shown in Figure 4, there appear to be some important, systematic differences. These differences are compared to in-track error in Figure 5, and show a high correlation. Thus differences between the predicted drag (ndot/2 or B*) and the actual drag ($\Delta n/\Delta t$) are an important source of orbit propagation error for SGP4.

The effectiveness of LOKANGL of determining actual drag by interpolating over element set pairs was evaluated. A time step of one hour was used. The prediction error in processing every second, third, and tenth TLE with respect to the full TLE set was examined. The one hour time step ensures a consistent treatment for all comparisons regardless of the TLE set decimation. Results using every second TLE for F10 (satellite #18123) are shown in Figure 6. For this one month period the mean error and standard deviation of the error are each 101 m, although there are more than 20 periods when the error exceeds 200 m. This figure summarizes how the LOKANGL orbit interpolation errors grow as we increase the TLE time spacing from 8 to 16 hours.

A similar study for DMSP F15 over a three month period is presented in Figure 7. The mean error and standard deviation of the error are about 75 m, with 16 periods where the error exceeds 200 m. It is interesting to note that the errors are significantly smaller compared to the previous case.

A summary of errors for these and other TLE spacings is given in Table 1.

Conclusions

Error sources in DMSP satellite orbit propagation for 1999 and 2000 were examined. The TLEs appear to be of high quality, although several abrupt changes in the Keplerian components were noted. A comparison of single precision and double precision versions of SGP4 indicated that the double precision version should be used in order to minimize computational round-off.

It was found that differences between ndot/2 values computed from mean motion and those provided in the TLEs were highly correlated with computed in-track error values, showing that the ndot/2 and B* drag terms are a large error source in orbit propagation.

The effectiveness of computing actual drag values using element set pairs was evaluated using the LOKANGL program. It was found that the relative orbit prediction error increased with the spacing between TLE pairs. Using this approach, it was found that the 1σ relative prediction errors are typically less than 200 m for TLEs with a spacing of 24 hours or less.

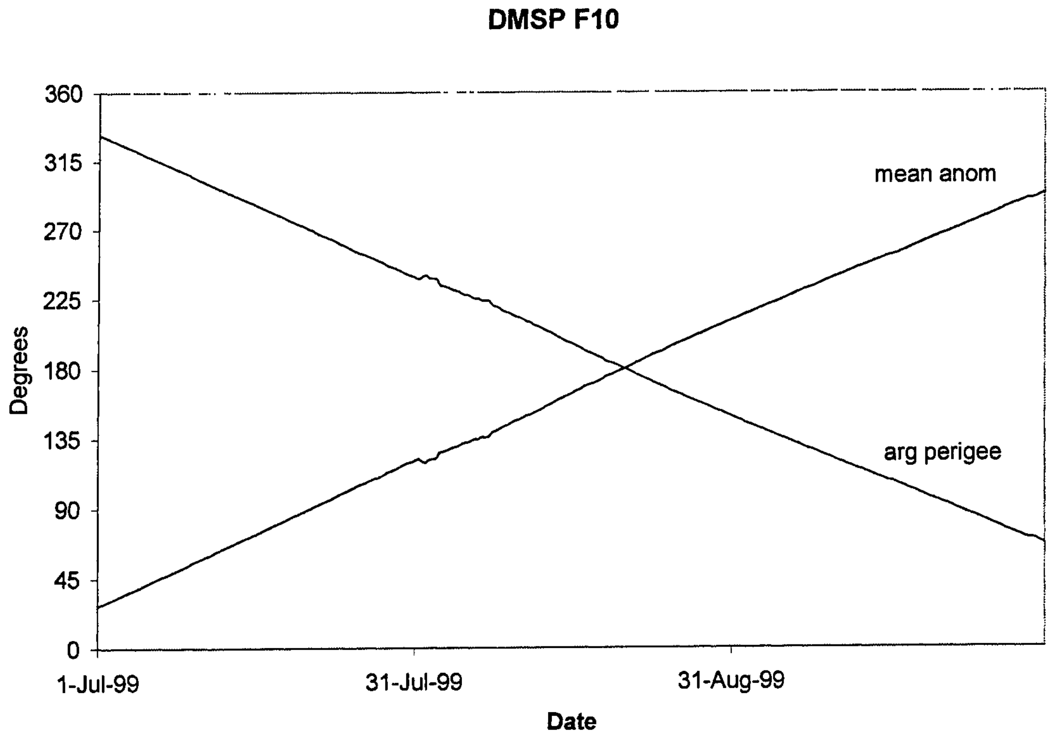

Figure 41. Original document Figure number 1.

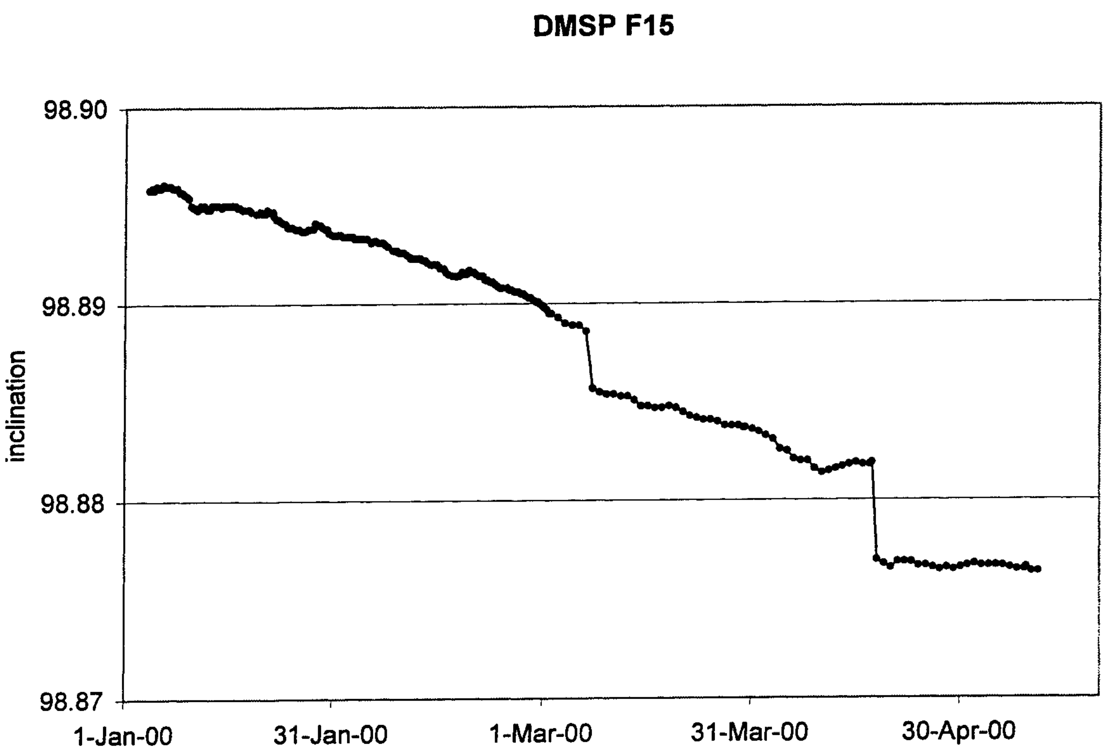

Figure 42. Original document Figure number 2.

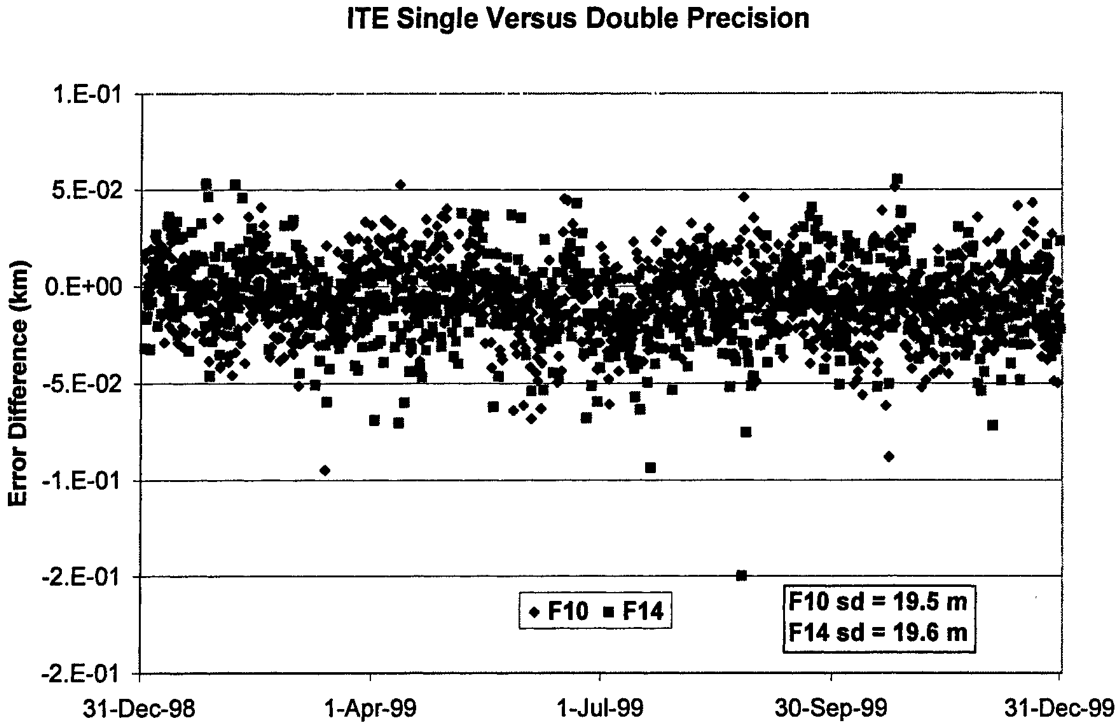

Figure 43. Original document Figure number 3.

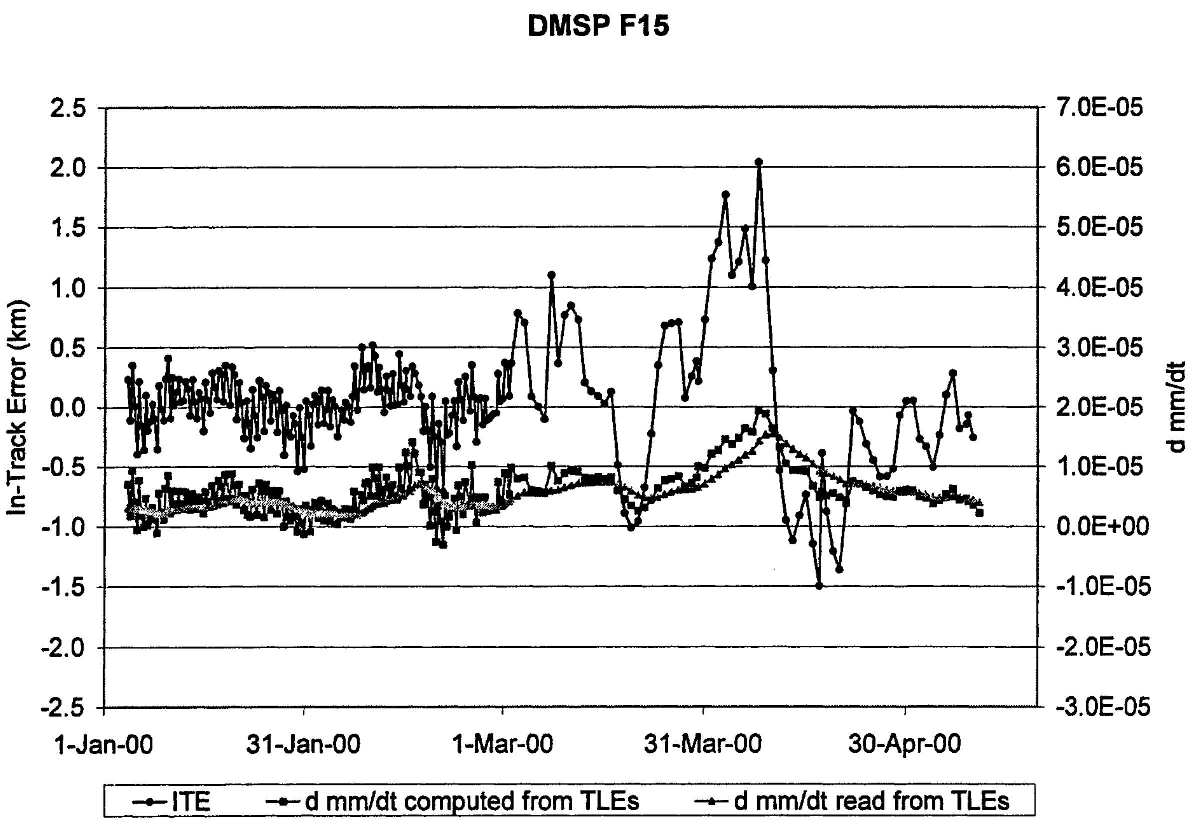

Figure 44. Original document Figure number 4.

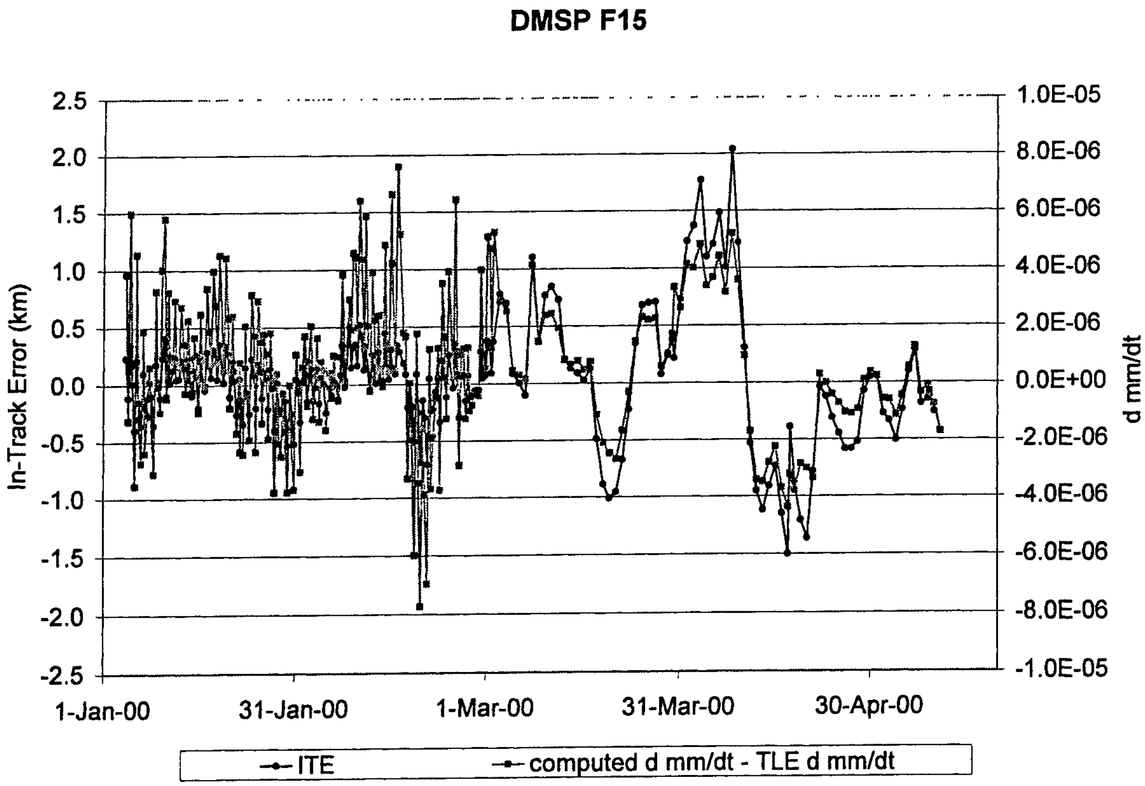

Figure 45. Original document Figure number 5.

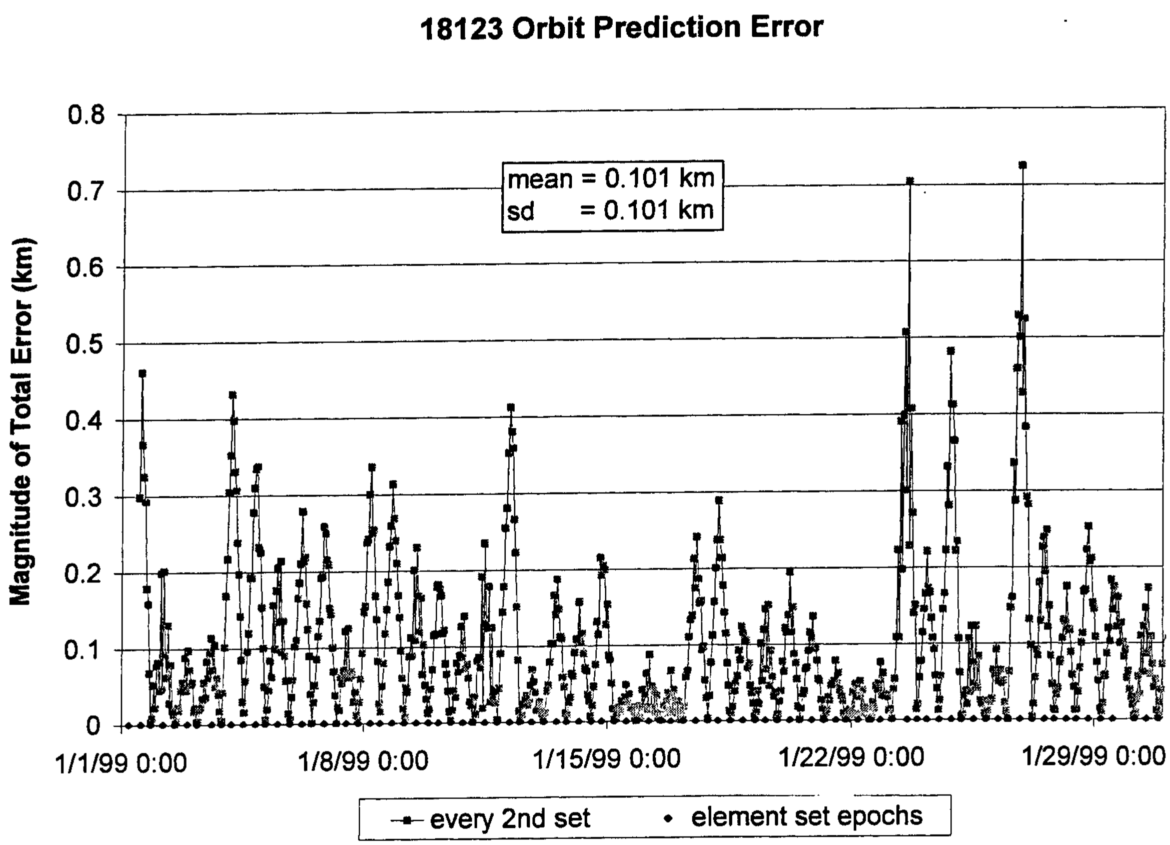

Figure 46. Original document Figure number 6.

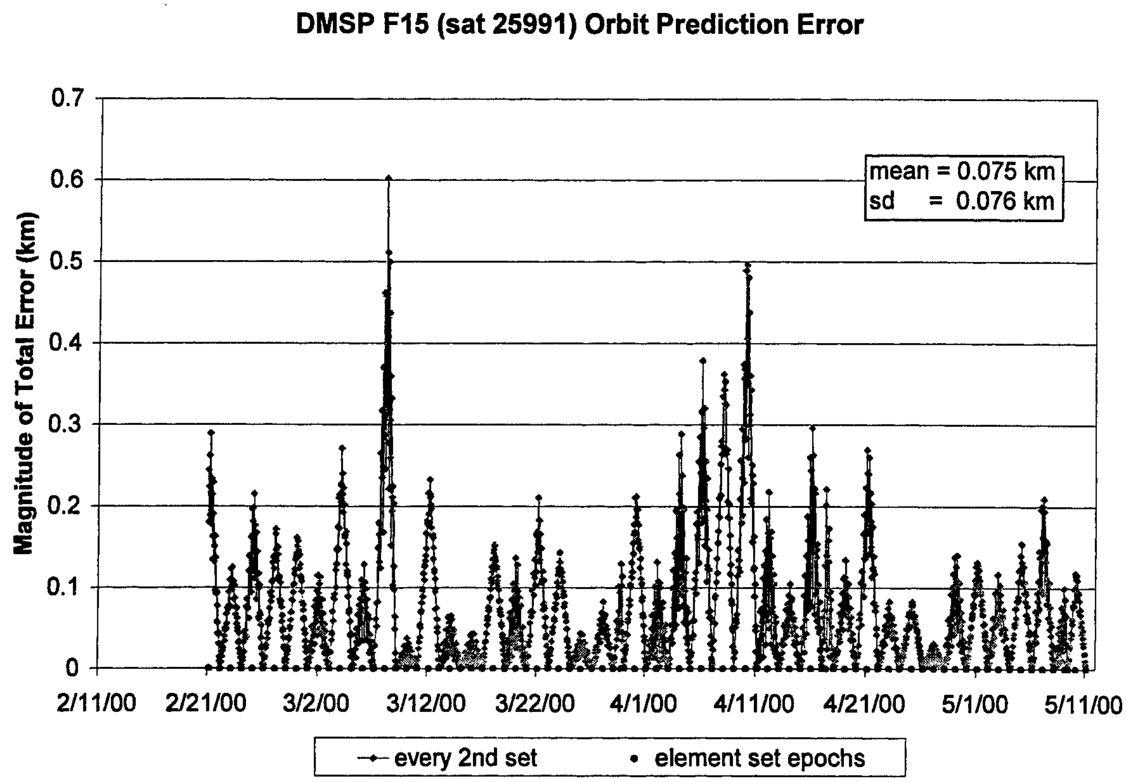

Figure 47. Original document Figure number 7.

Original document Table number 1					
DMSP SAT	TIME SPAN	# OF TLEs	# STATE VECTORS	MEAN ERROR (m)	σ OF ERROR (m)
F10	1 Jan 99 31 Jan 99	91	721	every 2nd: 101 every 3rd: 167 every 10th: 234	101 129 178
F15	21 Feb 00 11 May 00	84	1933	every 2nd: 75 every 3rd: 161 every 10th: 1058	76 151 959

APPENDIX H. ADDITIONAL BOOM STUDY PLOTS

This appendix contains GIF files that show various plots generated during this experiment. These plots illustrate parts of Sections 4.6 through 4.9 and are all introduced in Section 4.6.1. They are listed in the following order:

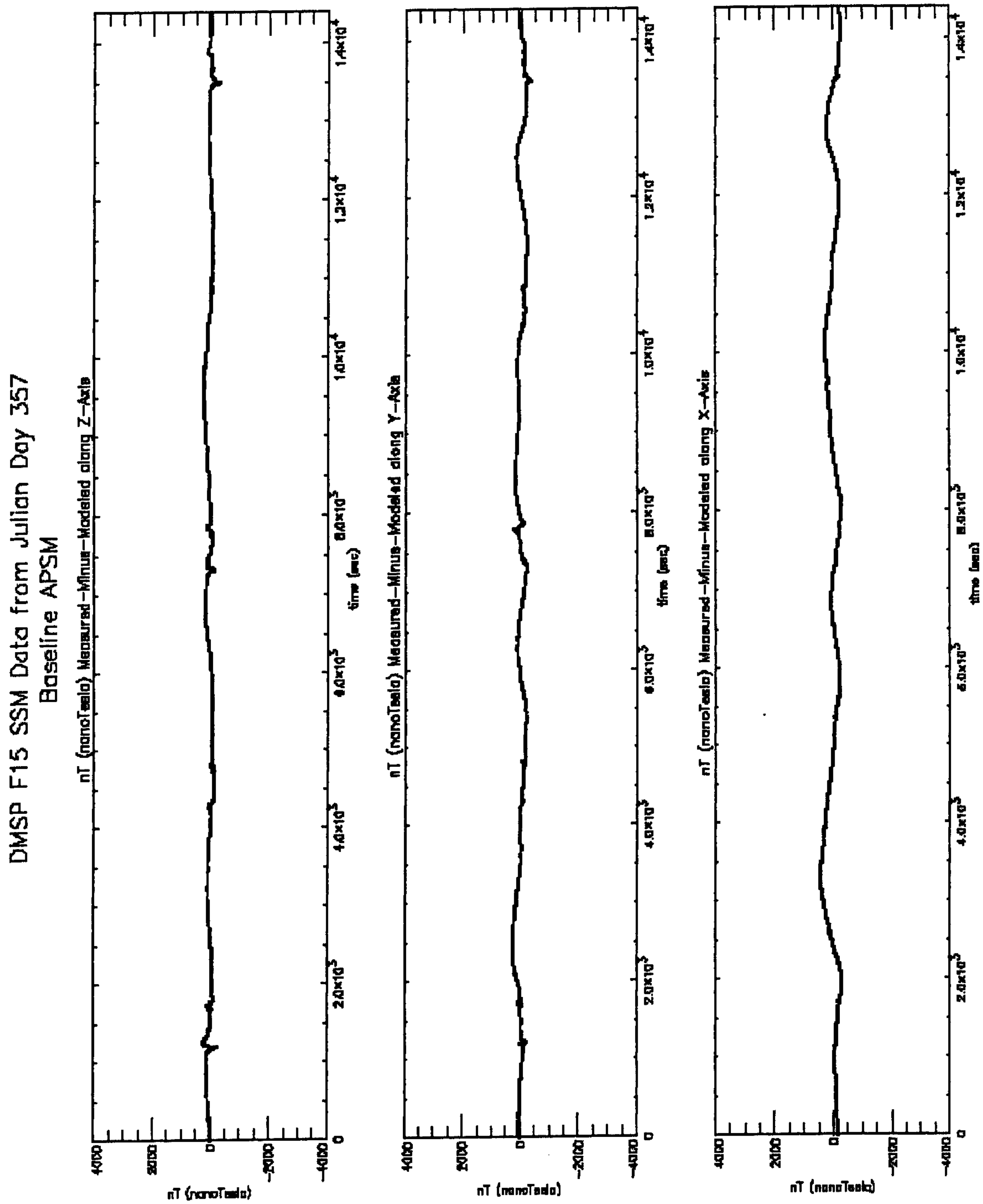

Figure 48. Baseline curve, Day 1999-357, 00:00-04:00 UT. Referred to in Sections 4.6.1, 4.6.2.1 and 4.8.2.1.

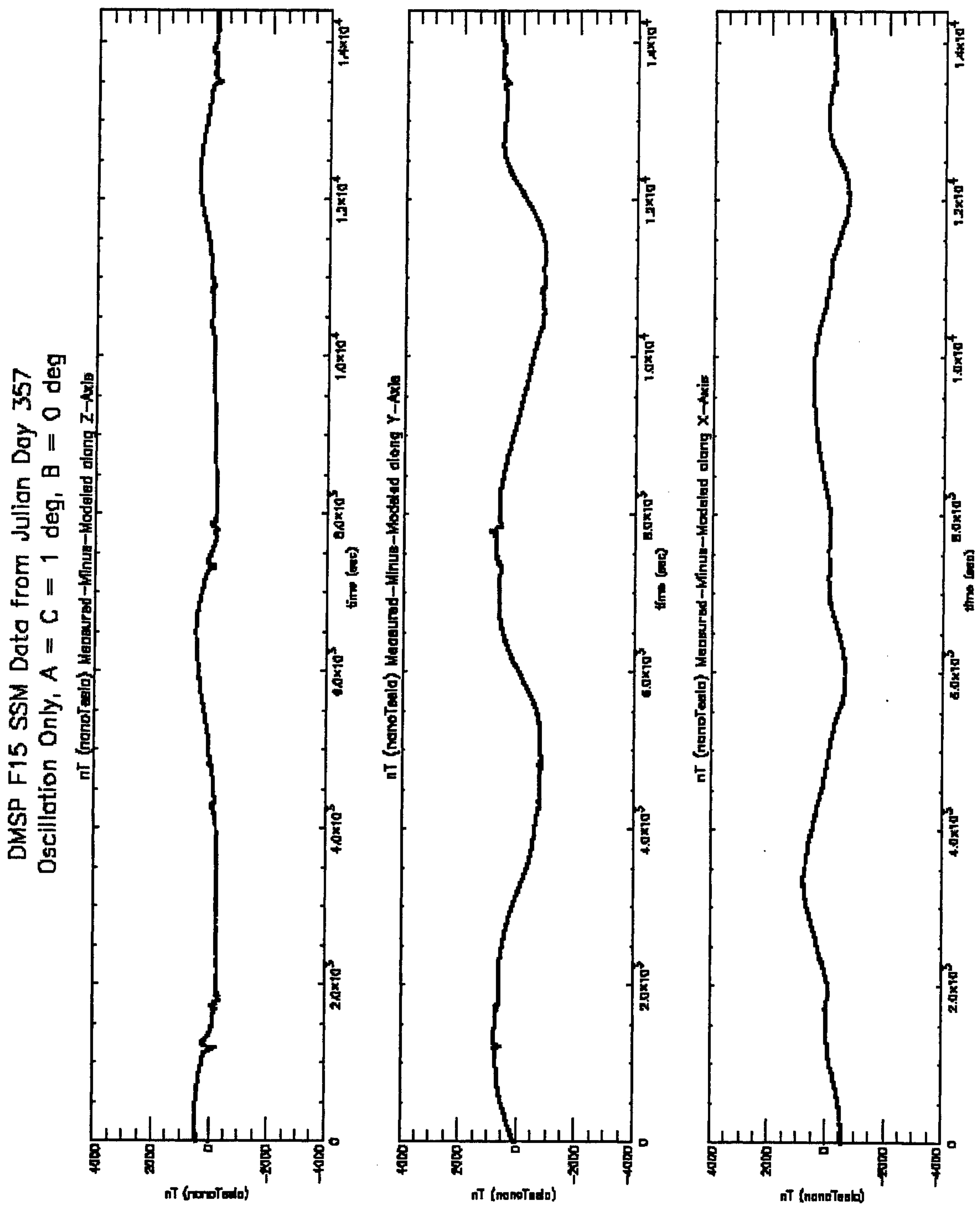

Figure 49. Continual twist, (A,B,C) = (1,0,1) Day 1999-357, 00:00-04:00 UT. See Sections 4.6.1, 4.6.2.1, 4.6.2.2, and 4.7.2.

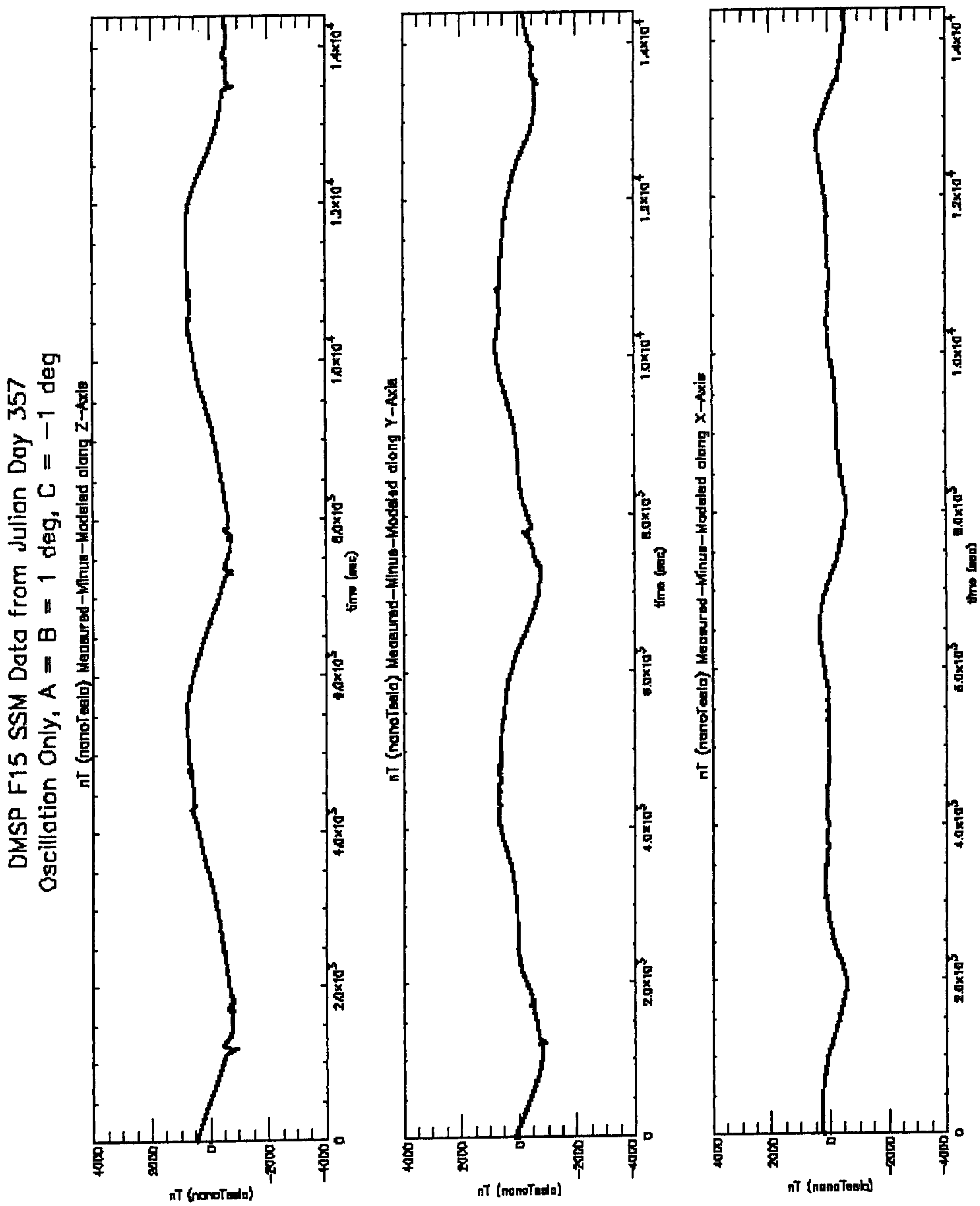

Figure 50. Continual twist, (A,B,C) = (1,1,-1), Day 1999-357, 00:00-04:00 UT. See Sections 4.6.1, 4.6.2.2 and 4.7.2.

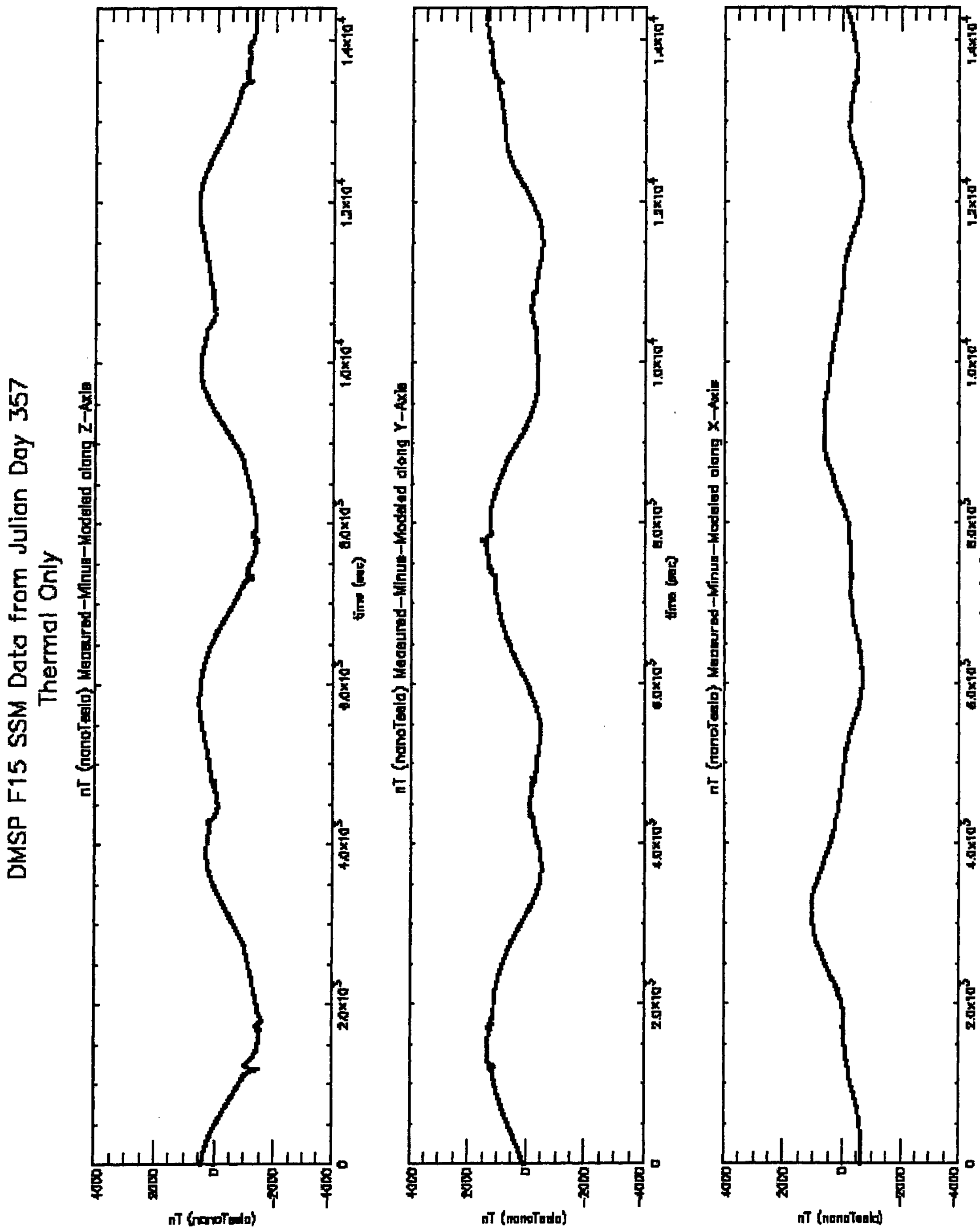

Figure 51. Thermal twist, maximum angle = 2.5 degrees, Day 1999-357, 00:00-04:00 UT. See Sections 4.6.1 and 4.6.2.1.

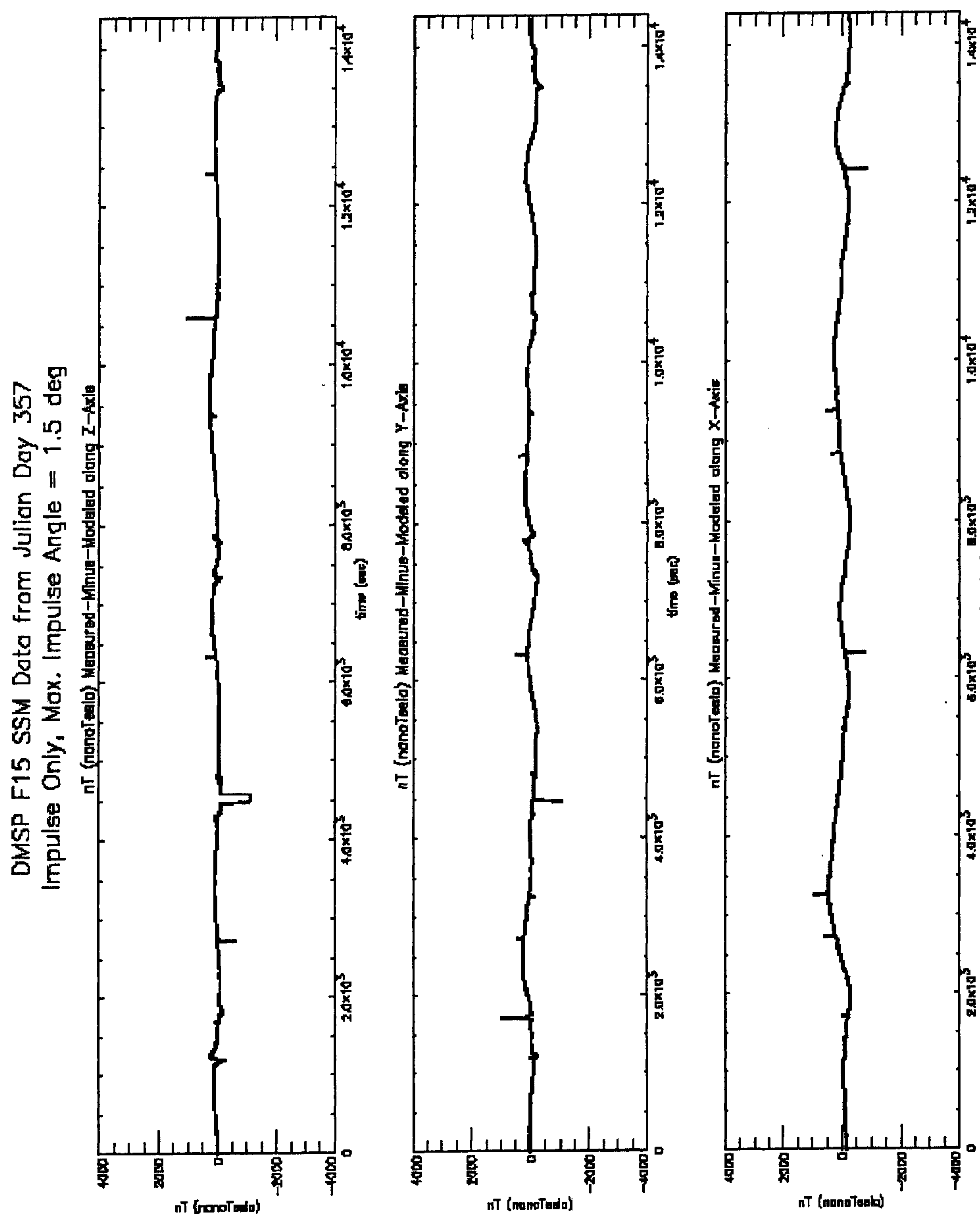

Figure 52. Impulse twist, maximum angle = 1.5 degrees, Day 1999-357, 00:00-04:00 UT. See Sections 4.6.1 and 4.6.2.3.

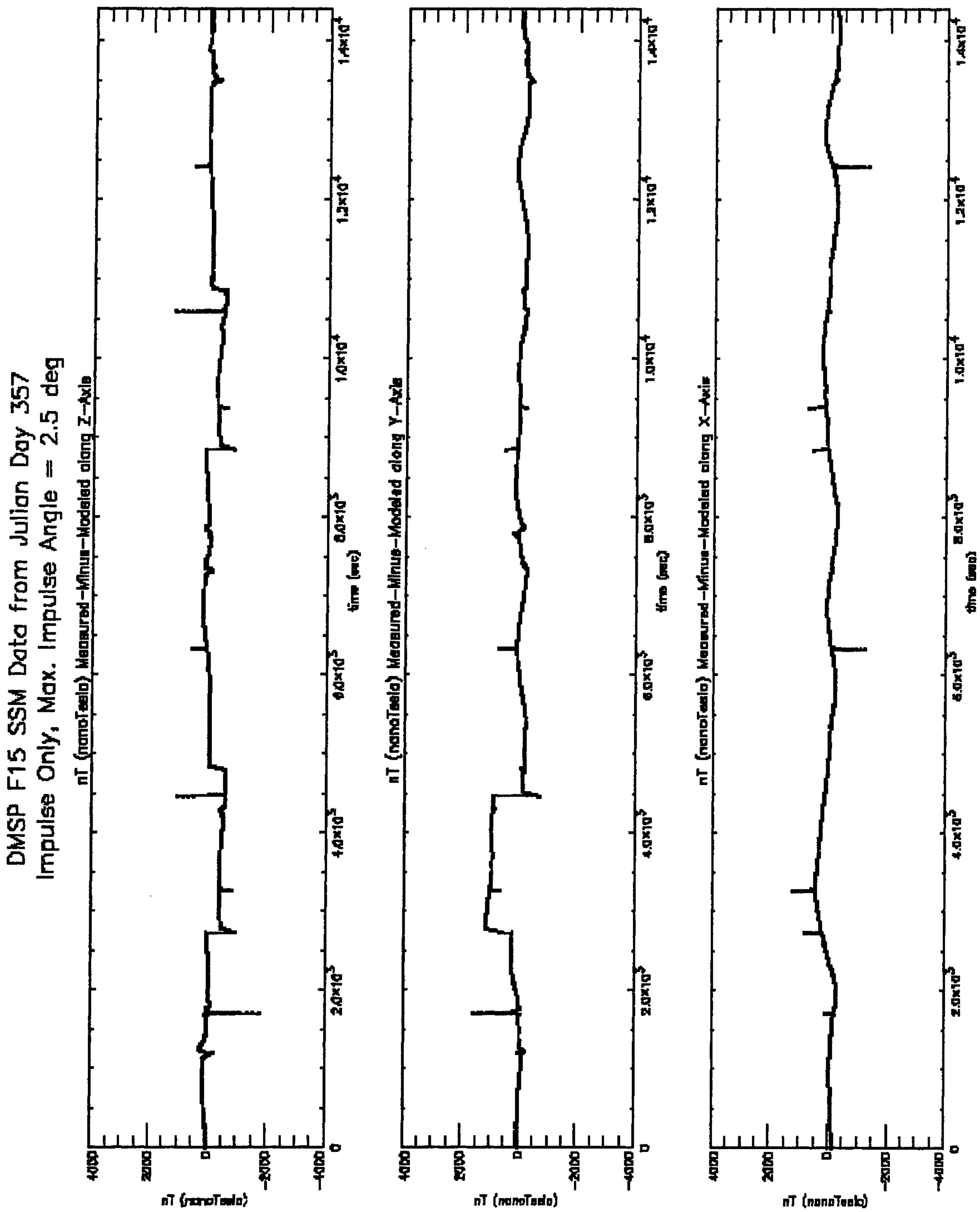

Figure 53. Impulse twist, maximum angle = 2.5 degrees, Day 1999-357, 00:00-04:00 UT. See Sections 4.6.1, 4.6.2.1 and 4.6.2.3.

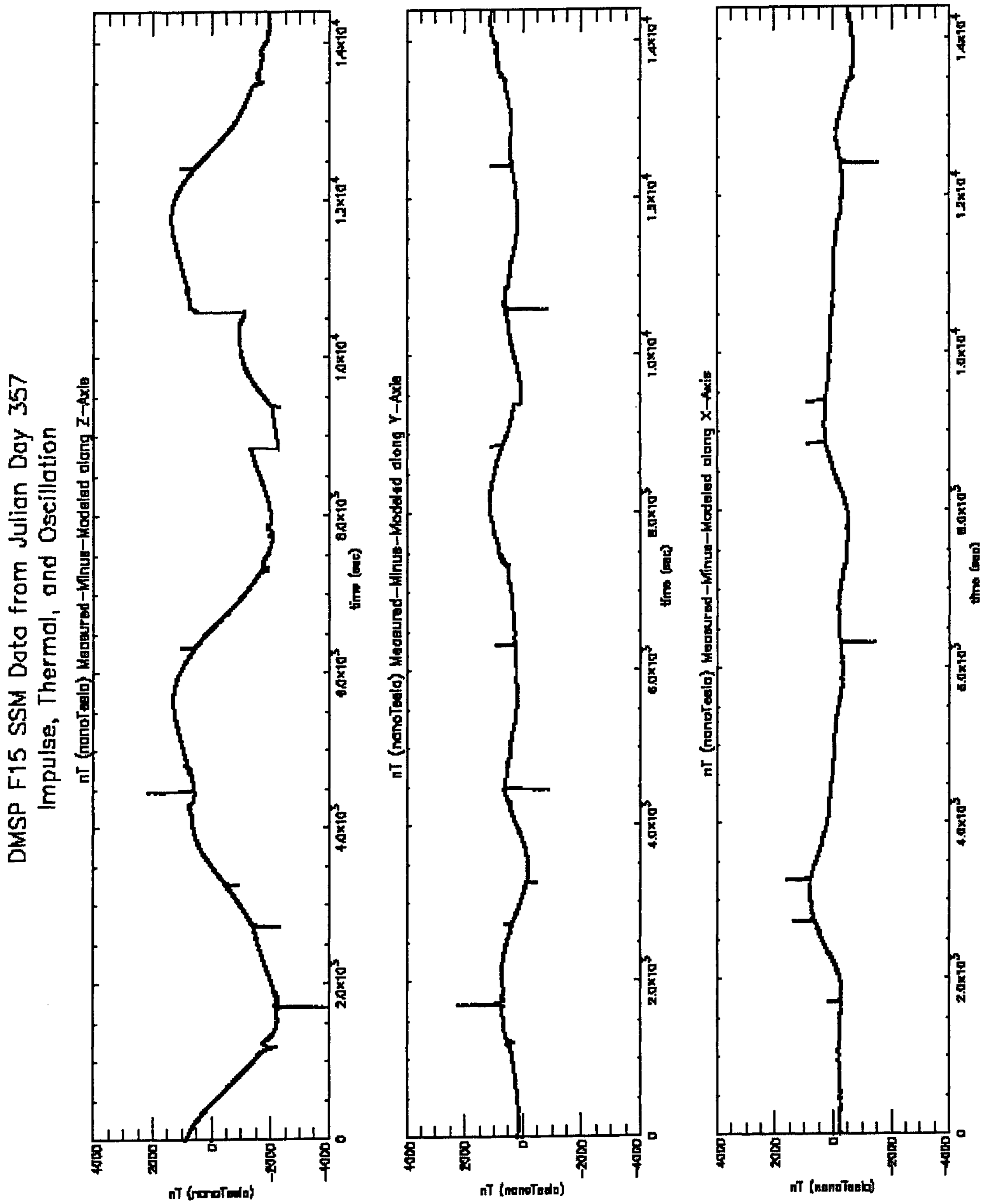

Figure 54. Combination of continual, thermal, and impulse twists, Day 1999-357, 00:00-04:00 UT. See Sections 4.6.1 and 4.6.2.1.

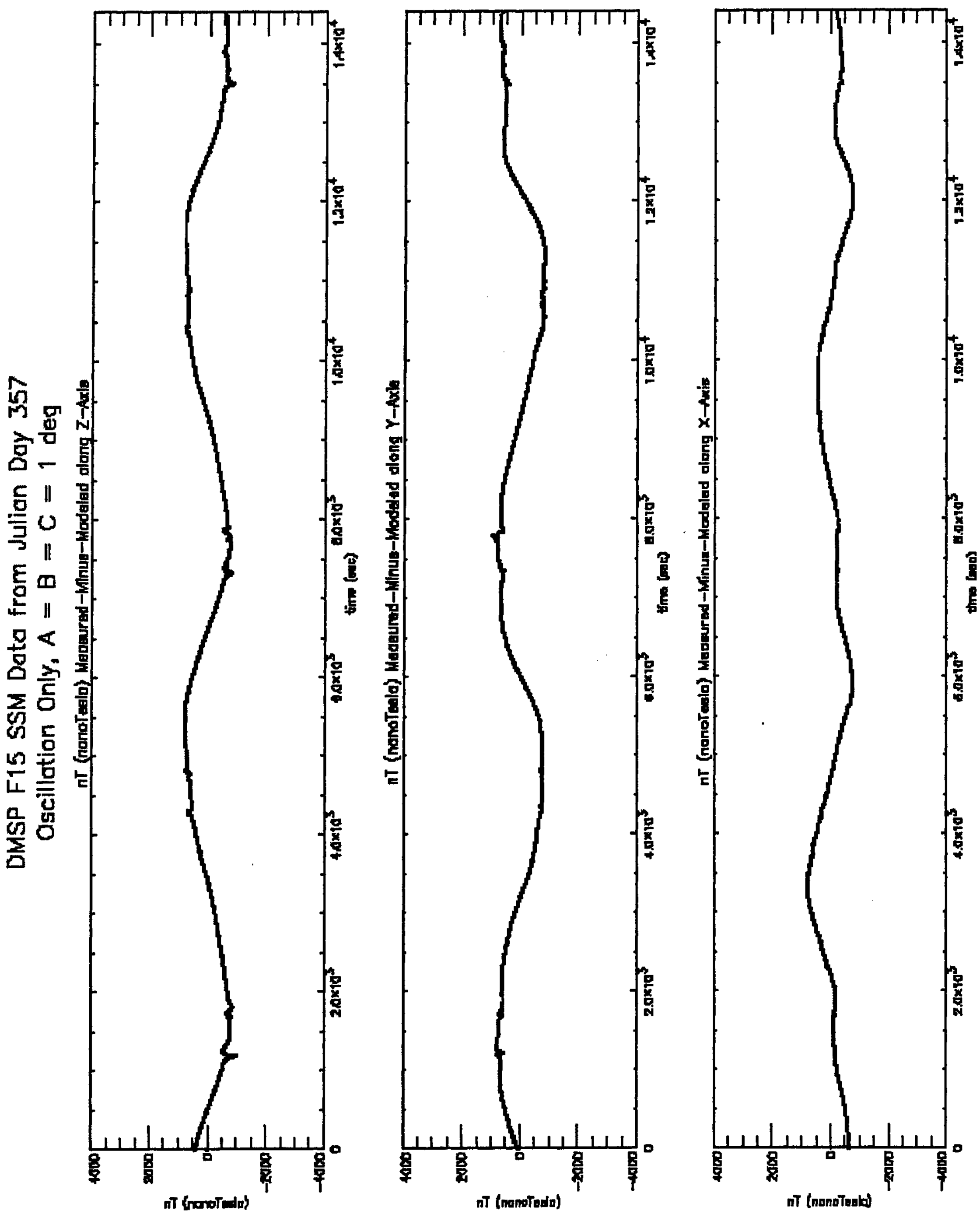

Figure 55. Continual twist, (A,B,C) = (1,1,1), Day 1999-357, 00:00-04:00 UT.
See Sections 4.7.1 and 4.7.2.

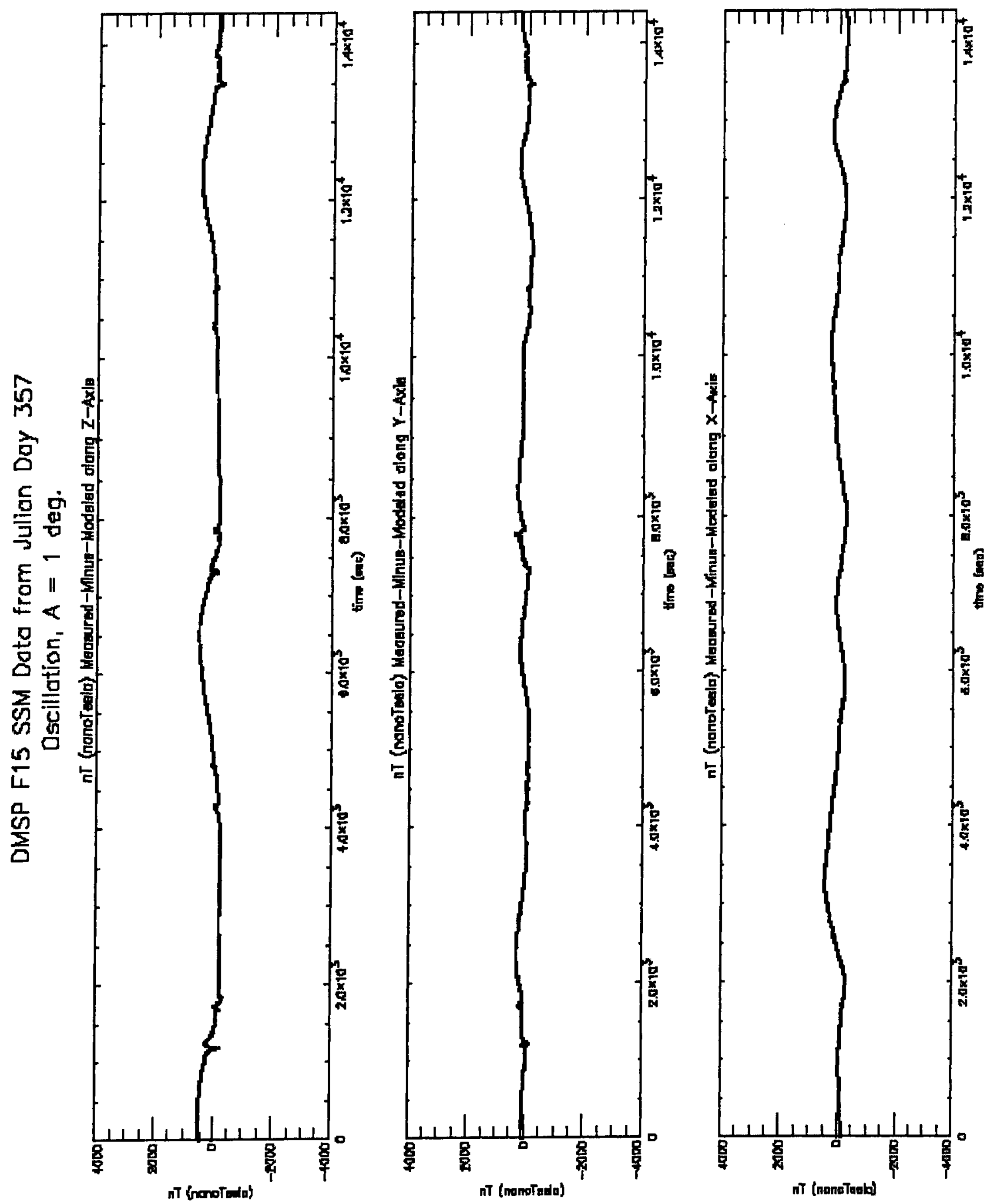

Figure 56. Continual twist, (A,B,C) = (1,0,0), Day 1999-357, 00:00-04:00 UT. See Sections 4.7.1 and 4.7.2.

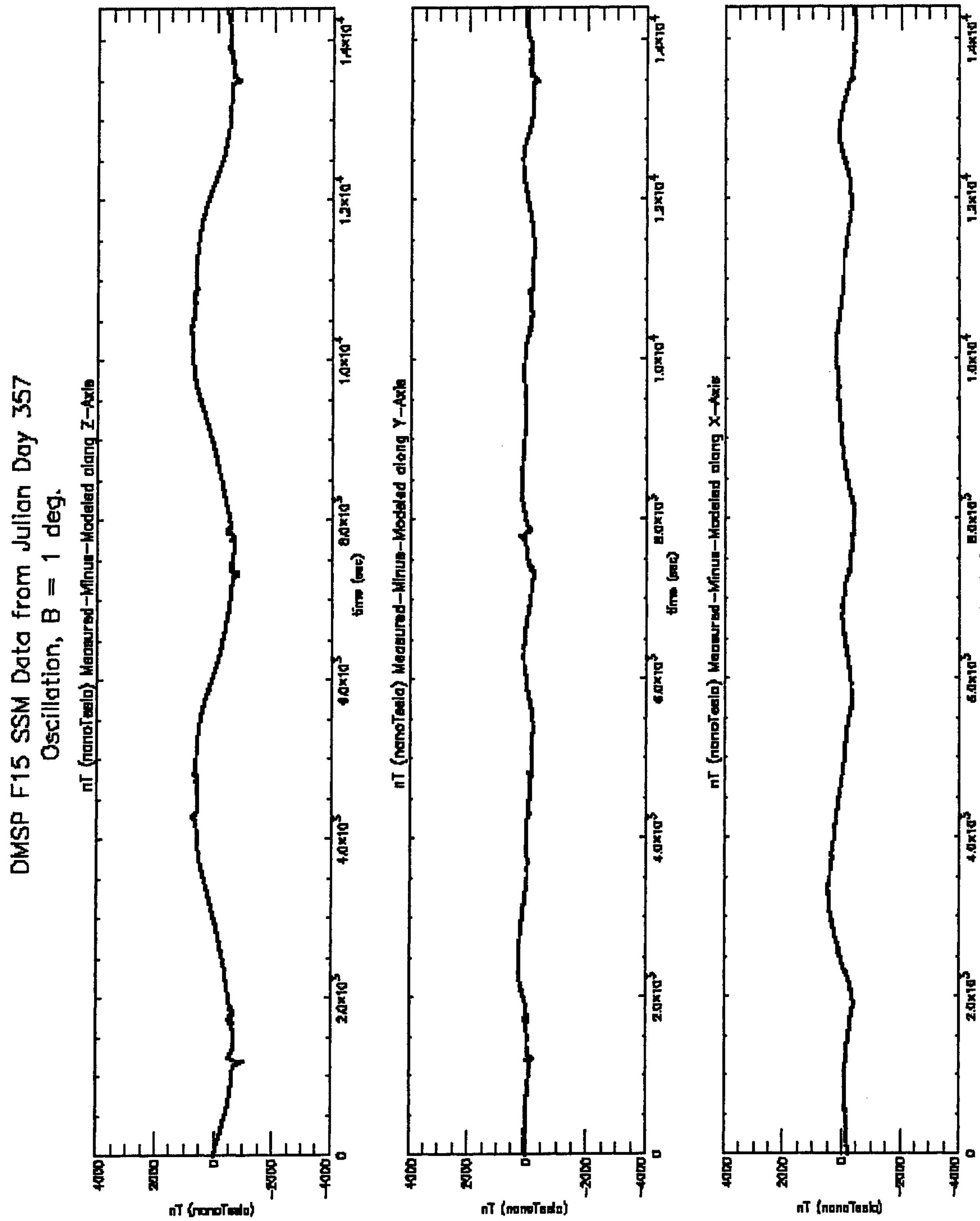

Figure 57. Continual twist, (A,B,C) = (0,1,0), Day 1999-357, 00:00-04:00 UT. See Sections 4.7.1 and 4.7.2.

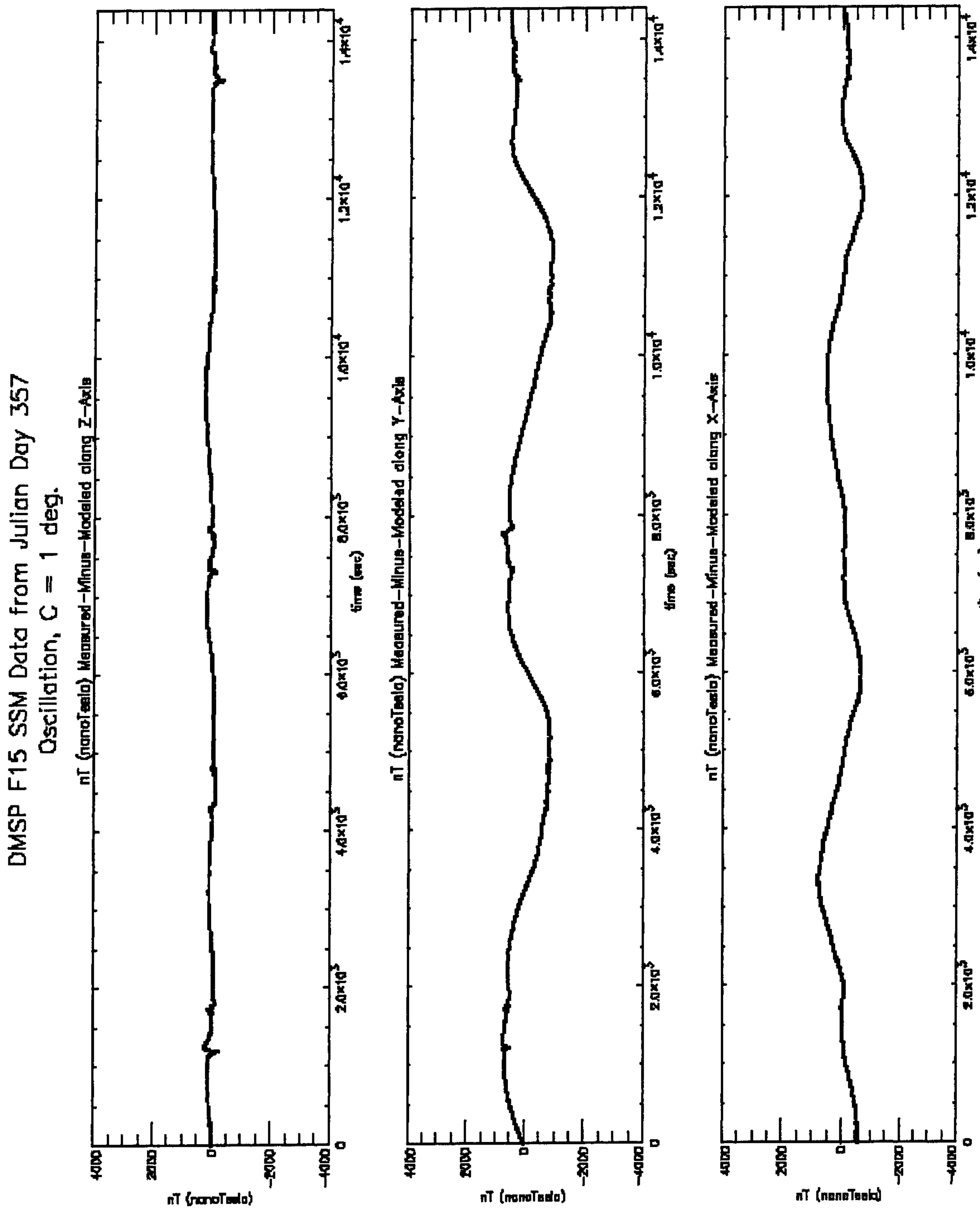

Figure 58. Continual twist, (A,B,C) = (0,0,1), Day 1999-357, 00:00-04:00 UT.
See Sections 4.7.1 and 4.7.2.

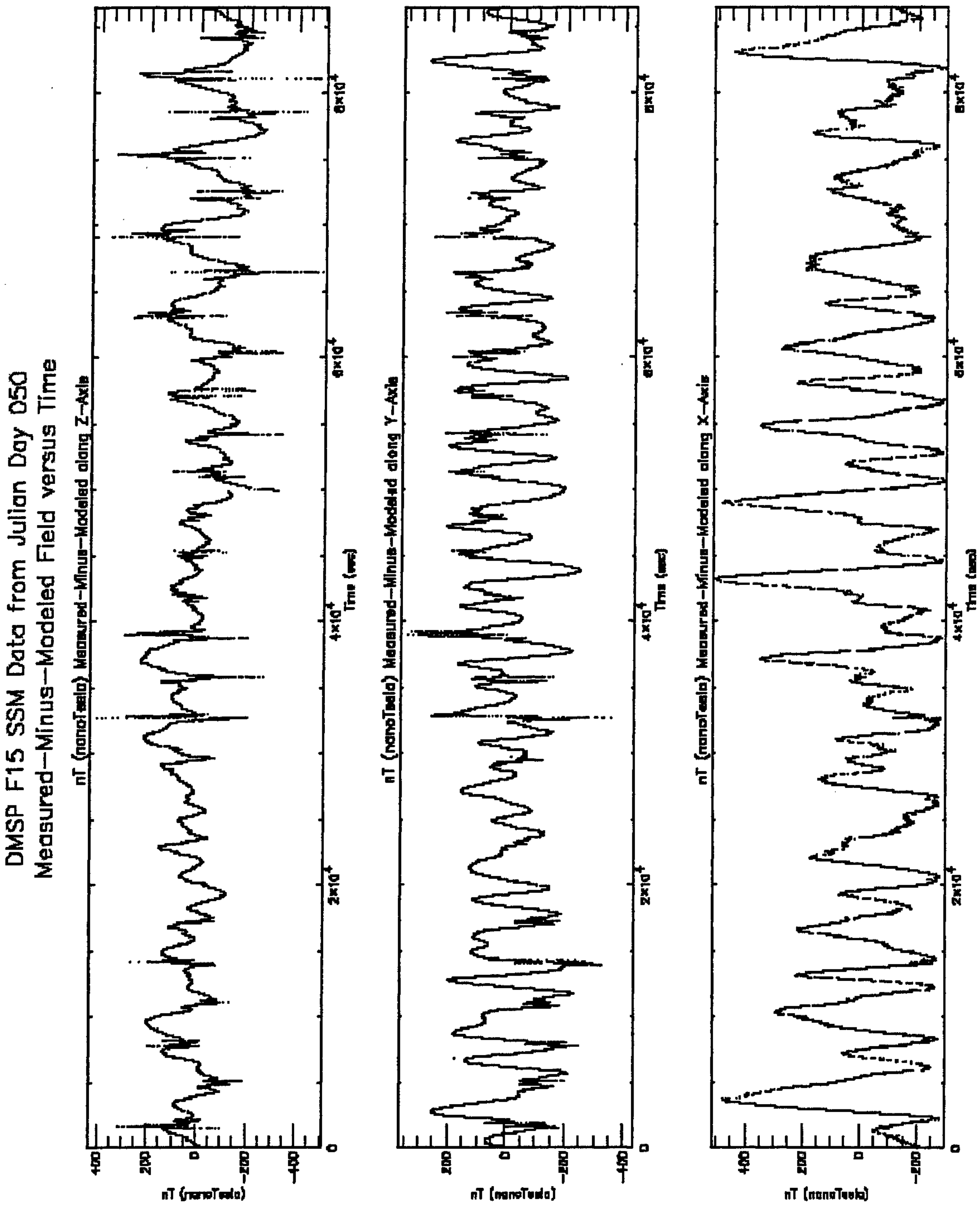

Figure 59. Baseline curve, field versus time, all 24 hours of Day 2000-050. See Section 4.9.2.1.

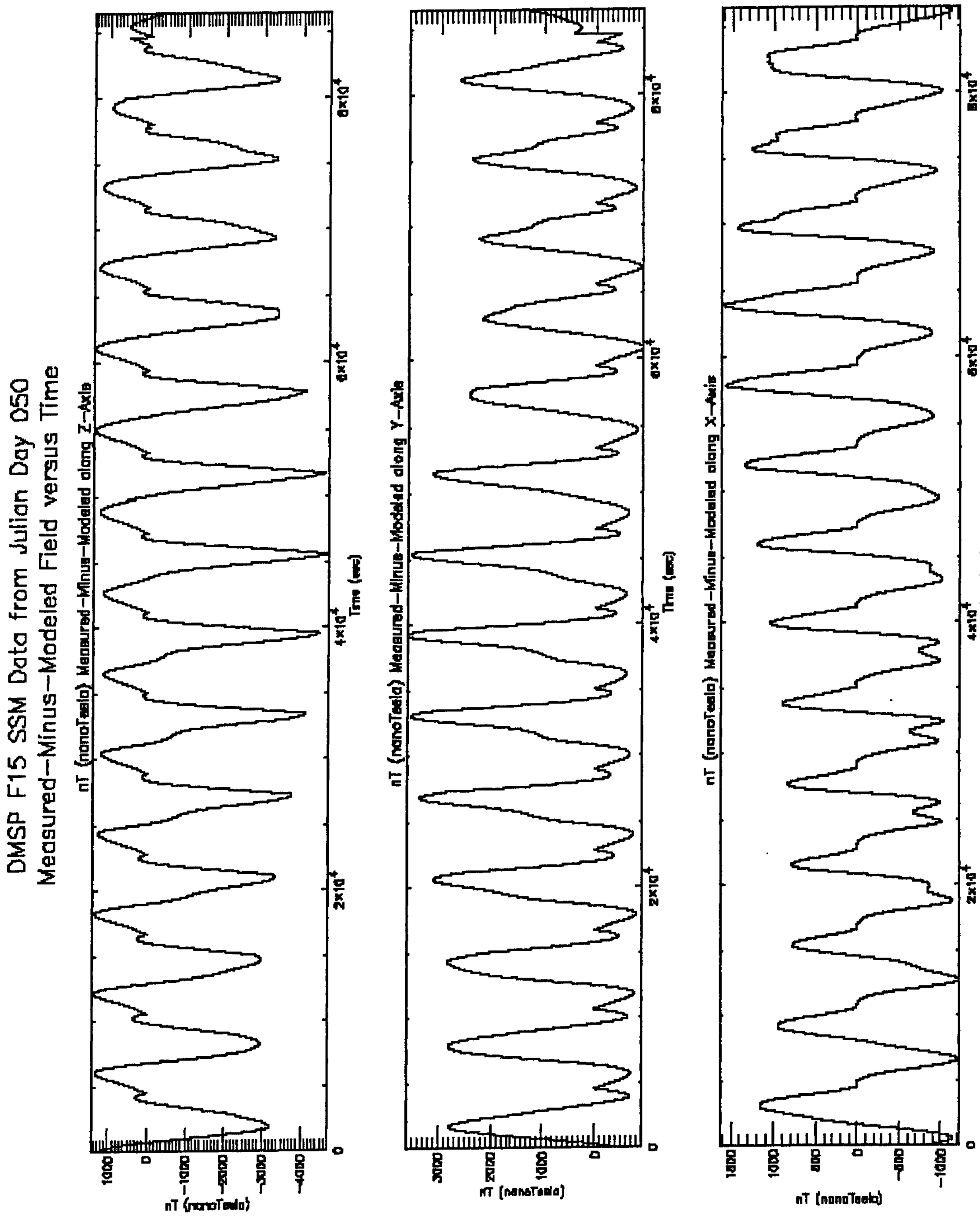

Figure 60. Thermal twist, field versus time, all 24 hours of Day 2000-050. See Section 4.9.2.1.

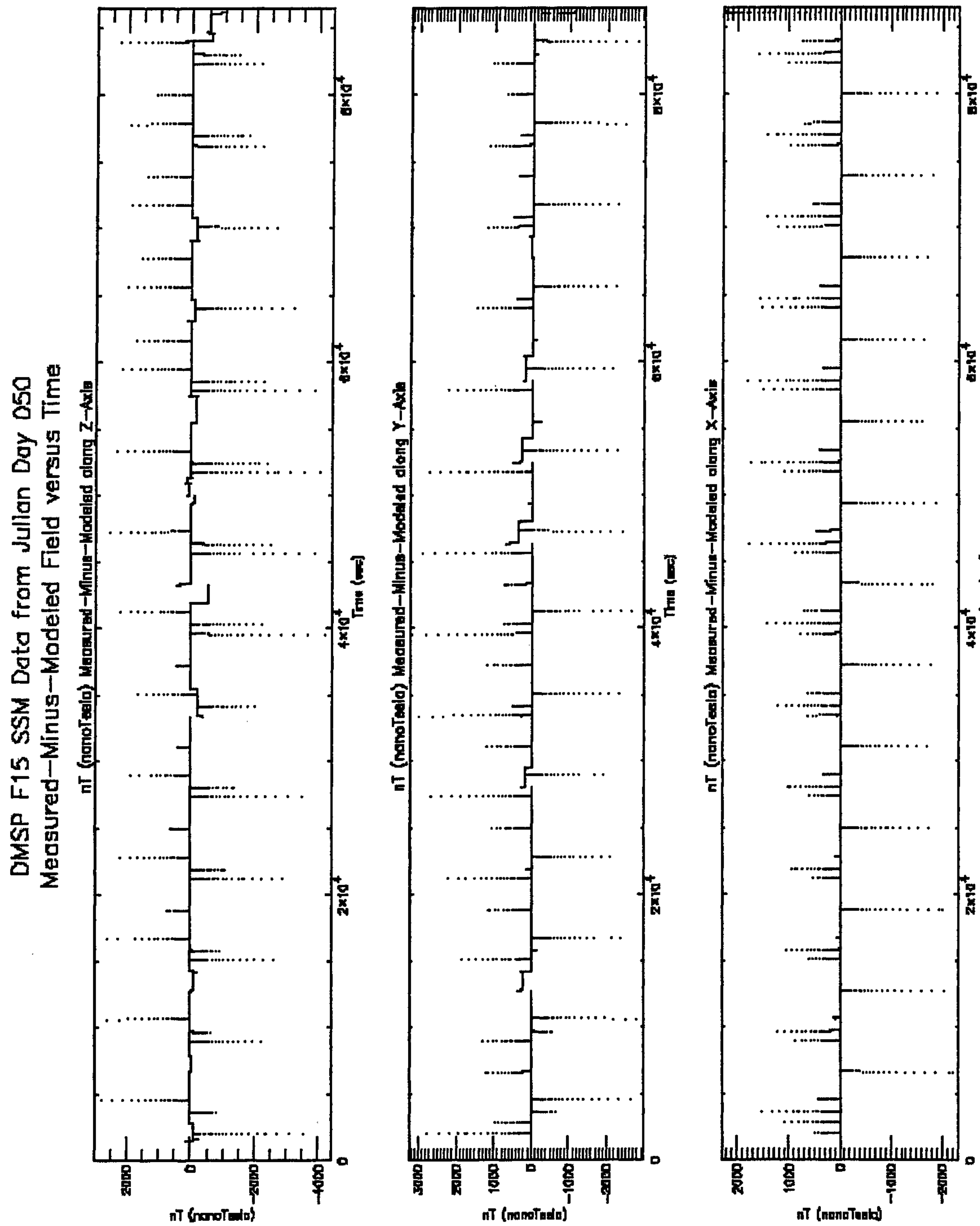

Figure 61. Impulse twist, field versus time, all 24 hours of Day 2000-050. See Section 4.9.2.1.

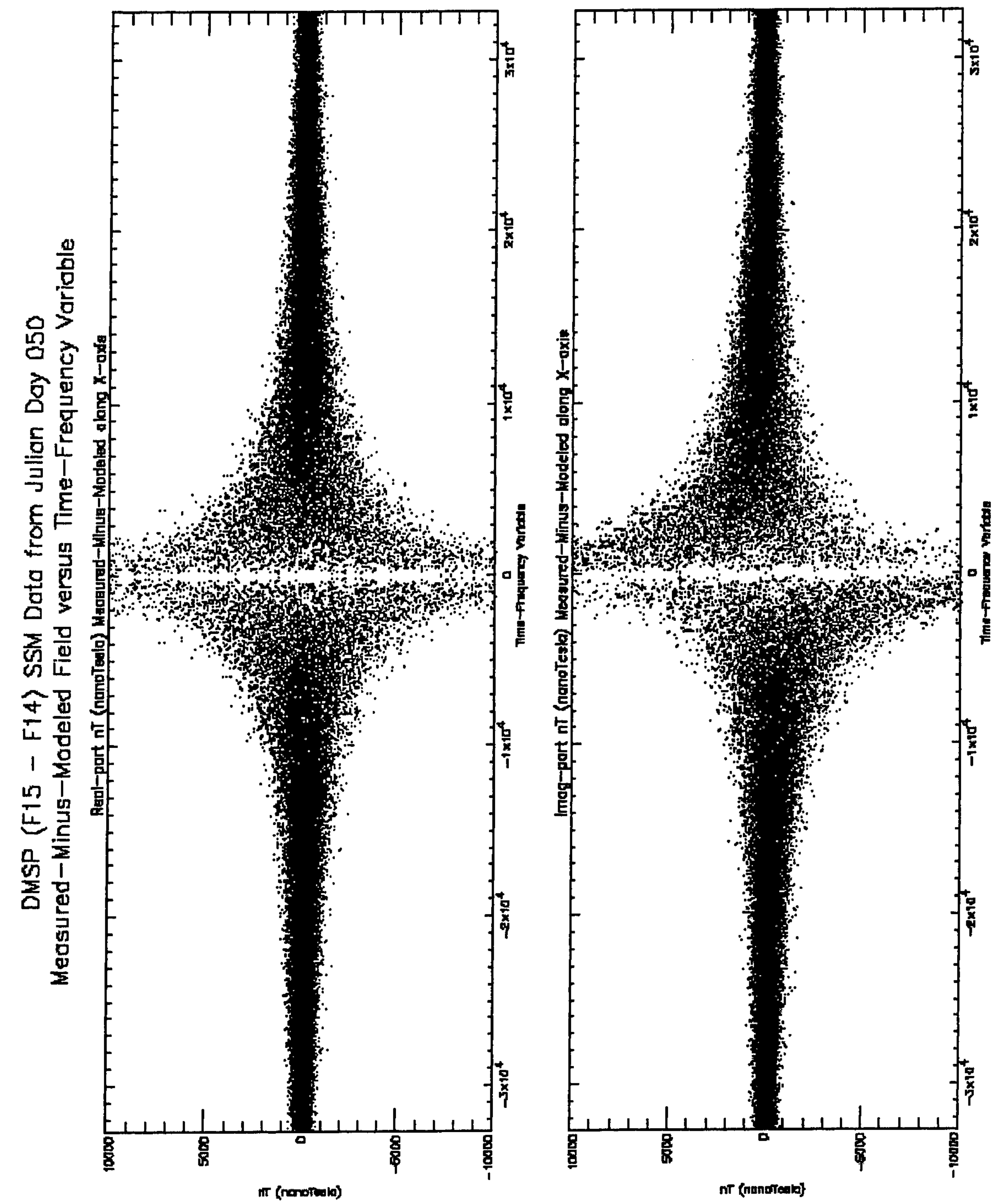

Figure 62. Baseline curve, FT of field vs. time, X-axis, all 24 hours of Day 2000-050, with only field values between -10000 and 10000. See Section 4.9.2.5.

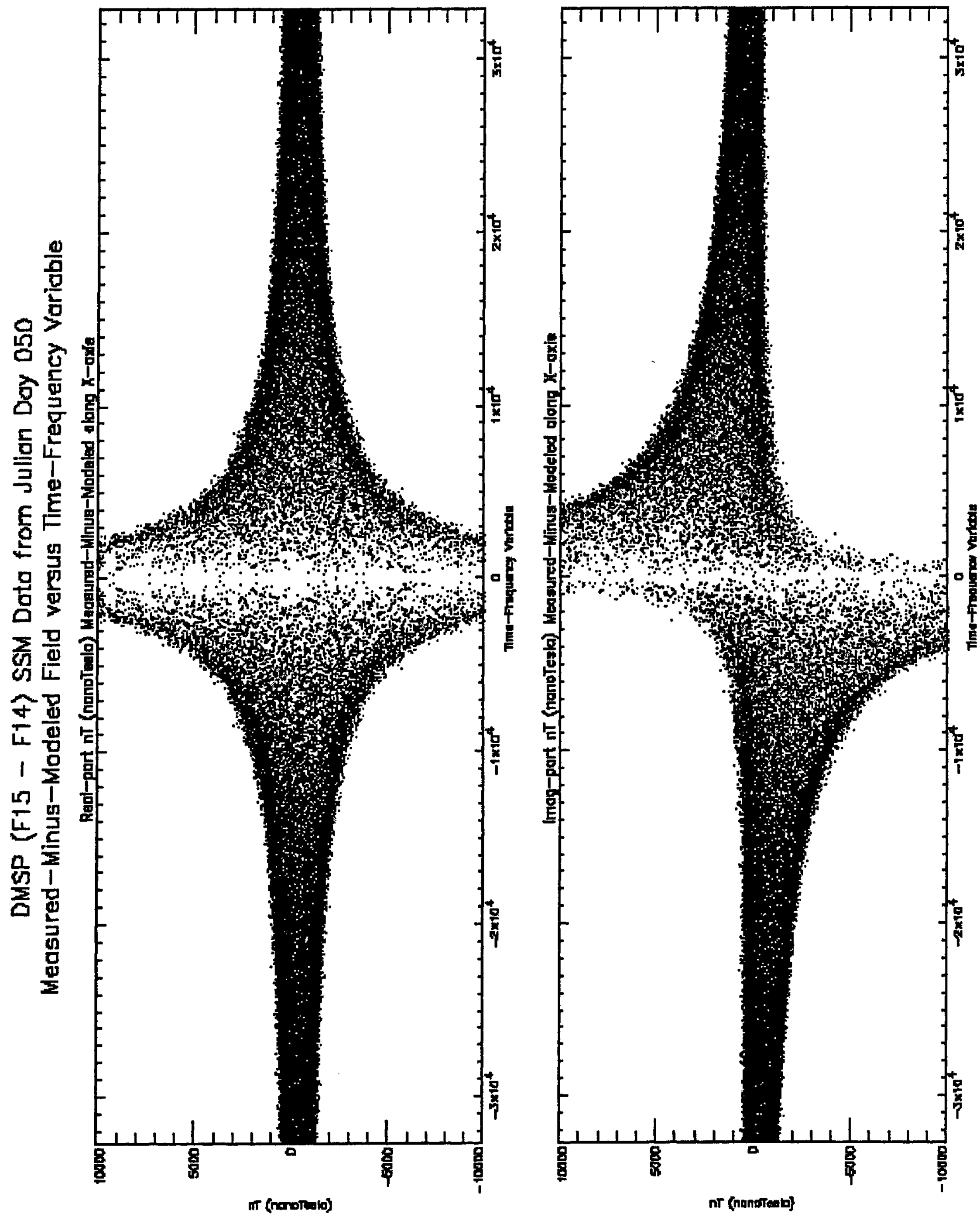

Figure 63. Thermal twist, FT of field vs. time, X-axis, all 24 hours of Day 2000-050, with only field values between -10000 and 10000. See Section 4.9.2.5.

APPENDIX I. GLOSSARY OR TERMINOLOGY

For reference, the terms and acronyms most frequently used in this paper are defined here.

AAVMMM	Average Absolute Value of the Measured-Minus-Modeled (MMM) magnetic field. This value is an index of the number and amplitudes of periodic functions in the MMM field.
active	Displaying many artifacts and jumps, as opposed to quiet. Active periods generally have a high Ap or Kp.
additive	Two boom twists that when added together, their joint effect on the resulting plot equals the sum of the individual effects. Here the sum is performed according to the rules of constructive and destructive interference of waves.
amplitude	The value of NanoTesla (nT) at the top or bottom of a curve or a piece of the curve. The amplitude is the maximum vertical distance, in nT, of the curve from the horizontal line of zero nT.
APHB	Old name for Program APSM.
APSM	The current FORTRAN program that converts raw magnetometer data into MFR files. Two introductory programs, SFC1 and SFC2, must be run before APSM to convert BC data files to APSM input files.
artifact	A disturbance in the baseline curve created by man or his works.
ascending node	A northbound crossing of the equator by the satellite.
auroral region	An interval of latitudes where auroras often occur. This interval usually lies in high latitudes in both hemispheres.
average absolute value	The average field strength in NanoTesla, independent of sign (plus or minus), over a set of field strengths in a given direction (X, Y, or Z).
B	B = [Bx By Bz], a magnetic field vector.

baseline curve	A curve that plots the measured-minus-modeled field without induced errors. The vector of data plotted in this curve is referred to within this report as "W." W can be assumed to measure the field difference "boom minus non-boom," since the "boom" quantity is the actual measurement recorded by F15 and the "non-boom" field is our best estimate of what the model would compute.
best fit	The most error reduction attainable by setting one or more parameters to the correct values.
boom	5m rod that protrudes from the satellite body. The F15 sensor is placed at the end of this rod.
Boston-College file	A raw data file of the format produced by software provided by Boston College.
bowstring	A long straight line running across a plot of field versus latitude, or across a similar-looking plot.
Bx	The X (down) component of a magnetic field vector.
By	The Y (direction of motion) component of a magnetic field vector.
Bz	The Z (orbit normal) component of a magnetic field vector.
calibration	A correction of the difference between the spacecraft axes and the magnetometer axes.
calibration accuracy	Consistency of the minimization of the difference between measured and modeled.
calibration drift	Change in optimal calibration as a function of time due to change in the factors being corrected by the calibration, again as a function of time. drift.
calibration error	The difference between measured and modeled excluding activity and artifacts.
calibration independence	The quality of not changing when the calibration matrices ORTHO and OFFSET are varied. For example, the boom-effect simulations of Sections 4.6, 4.7, and 4.8 are calibration-independent, but the boom-effect decomposition of Section 4.9 is not.

calibration matrix	A constant three-dimensional rotation or offset matrix used for calibration. For more information, see "calibration" above.
change of shading	Sudden change of grayness or color on a field-versus-altitude plot.
coefficient	A component of the solution vector of a least-squares equation. This coefficient is the value of a twist angle in degrees. Also, any solution constant, or any constant that multiplies a variable or another value.
complex number	A number with a real part and an imaginary part. See "real" and "imaginary."
component	One of N values of a vector or matrix. Also, one of three twist types (continual, thermal, or impulse) possibly present in a given curve.
continual oscillation	Effective rotation of the magnetometer around up to three axes, by an amount that remains constant over the course of a satellite orbit, due to a motion of the boom relative to the satellite.
cross-talk	Contribution of one dimension (e.g. X) of the magnetic field to what is hoped to be exclusively the measurement of the field in another dimension (e.g. Y).
damped impulse	Diminishing over time of the amplitude of an impulse twist.
dark spot	Intensely shaded (black) area on a field-versus-altitude plot.
(day-night) terminator	Borderline between daytime and nighttime regions of the earth. In general, the position of this borderline at the surface of the earth is different from its position at the satellite altitude.
day-of-year, day number	Number of days since last 12/31. For January 20, the day-of-year = 20.
decompose	To express an effect as the sum of its contributors. For the boom experiment, decomposition was the attempt to express the affect of the boom as the sum of three constituent twists.
definitive early calibration	Currently accepted value of the early calibration matrices for launch through day 2000-097.
definitive late calibration	Currently accepted value of the early calibration matrices from day 2000-098 onward.

deg	Degrees.
delta ("impulse") function	A function whose value is infinite at one point and zero at all other points. This function is plotted as a straight line extending upward from the horizontal axis at this point.
direction of motion	The "Y"-direction, which points in the direction where a DMSP satellite is heading. Also described as the velocity axis.
DMSP	Defense Meteorological Satellite Program.
domain	Variable on the horizontal axis, over which the magnetic field is plotted on the vertical axis. The domain is usually Universal Time, but can be satellite altitude, latitude, amount of sunlight, or the Fourier transform of any of the above.
down	The "X"-direction, which points from a DMSP satellite towards the center of the earth.
early calibration matrix	A least-outlying calibration matrix for launch through Day 097-2000.
ephemeris	Contains position information of a satellite for specified times.
F12, F13, F14	DMSP Satellites, launched before F15, whose SSM sensors are mounted on the main body of the spacecraft.
F15	The DMSP satellite launched 12/12/1999, whose SSM sensor sits on a boom.
FFT	Fast Fourier Transform, a time-efficient algorithm that approximates the Fourier Transform of a given equation.
flat day	A data day with a weak or non-existent sine wave in the Z-curve.
FT	Fourier Transform. A time-domain function $x(t)$ converted to a frequency-domain function $X(f)$. Here the frequency "f" is proportional to $1/t$, where t = time.
geographic coordinates	Latitude and longitude based on the true north pole.
geomagnetic coordinates	Latitude and longitude based on the magnetic north pole.
GIF	Graphics-Interchange Format. The plots generated in this experiment are GIF files whose three-letter extension is ".GIF."

IDL	Interactive Data Language, the programming language of the plot algorithms in this experiment.
IGRF	International Geomagnetic Reference Field. A model of the magnetic field of the earth. This model is updated every five years. The last update, IGRF-2000, is dated January 1, 2000.
imaginary	A multiple of j, which is the theoretical square root of -1. A complex number consists of two parts: real and imaginary. However, the letter "i" is usually used instead of "j".
impulse twist	Brief effective rotation of magnetometer around up to three axes, by an amount that is quickly damped. Simulates by a motion of the boom relative to the satellite.
in-flight calibration	Calibration done after the satellite is launched. In-flight calibration simply multiplies a constant three-dimensional rotation matrix by the measured field and adds a 3x1 vector. For more information, see "calibration" above.
in phase	Used to describe two sine waves of the same period whose peaks coincide.
jump	A step up-and-down discontinuity in the plotted curve of magnetic field strength.
kink	A sharp curve bend on a field-versus-altitude plot, conceivably due to a thermal twist in the boom.
late calibration matrix	A least-outlying calibration matrix from Day 098-2000 onward.
latitude peak	The northernmost or southernmost point in the orbit of the satellite.
least-squares	A mathematical technique to find a vector of values that minimize the square-norm of a given error. See also "linear least-squares."
linear	Additive and multiplicative.
linear least-squares	A least-squares equation whose solution vector is obtained by solving a system of linear equations. See also "least-squares."
local time	Time of day where the satellite is.

long sawtooth	One of a series of end-to-end lines on the X-curve with short breaks between them. These sawteeth run along the flow of the curve. A sawtooth error function with a longer period. For more information see "sawtooth, short sawtooth" below.
magnetic coordinates	Latitude and longitude based on the magnetic north pole.
magnetometer	A sensor that measures the strength of a magnetic field.
magnitude	Absolute value of a number, or straight-line length of a vector.
Magnitude AAVMMM	Average magnitude of the MMM field over all data points in a given day. For each data point, the MMM magnitude is the square root of $(X^2 + Y^2 + Z^2)$. Here X, Y, and Z are the three components of the MMM at this data point.
maximum absolute value	The highest value of field strength in NanoTesla, independent of sign (plus or minus), among a set of field strengths in a given direction (X, Y, or Z).
measured field	The strength of a magnetic field, according to measurement by a satellite sensor.
measured-minus-modeled field	Also called "MMM." The measured field minus the modeled field. Theoretically, MMM = 0 nT for a perfect model on a day with no magnetic activity.
MFR	Magnetic-Field Record of SSM measured-minus-modeled field strengths
MFR file	Contains MFRs. The main output of APSM.
MMM field	Measured-Minus-Modeled magnetic field, the error in a measured magnetic field of the earth along the track of a DMSP satellite. The MFR file contains the MMM field.
modeled field	The strength of a magnetic field as computed by a model, such as IGRF-2000, of the internal magnetic field of the earth.
multiplicative	A boom twist that when multiplied by a factor N, multiplies its effect on the resulting plot by the same factor N.
natural phenomena	Non man-made disturbances of the magnetic field. For example: auroras, storms, equatorial magnetism.

noise	Random changes in the magnetic field. Changes and effects below the measurement/analysis threshold of the SSM/APSM. "In the noise" does not mean that it drowned out something. However, it means that we simply can not measure/analyze precisely enough to study something that is "in the noise." Conversely, if an effect can not be observed above the noise, it can not affect what we can measure/analyze.
nT	NanoTesla, the unit of strength of a magnetic field.
OFFSET	A constant 3x1 offset matrix used for calibration. For more information, see "calibration" above.
optimal	Used to describe a value that minimizes a given error.
orbit normal	The "Z"-direction, which points parallel to the direction of the orbit normal of a DMSP satellite.
Ørsted	A Danish satellite launched on 02/23/1999. The main goal of its mission is to accurately map the magnetic field of the earth. For more information see Section 3.6.
ORTHO	A constant 3x3 rotation matrix used for calibration. ORTHO can be written as the product of the three basic rotation matrices $R_A R_B R_C$. For more information, see "calibration" above and "R_A," "R_B," "R_C," and "rotation matrix" below.
oscillation	See "twist error" below.
out of phase	Used to describe two sine waves of the same period whose peaks occur at different times. For example, if the peaks are 1/4 period apart, the waves are 90 degrees out of phase. See also "period."
peak	The top part of a curve, as opposed to its trough or valley.
period	Time (in seconds) between repetitions of a feature (such as a wave peak) on a plotted curve.
periodic function	Function whose features repeat every N seconds, where N is a positive number. Also, a function that approximately equals such a repetitive function.
phase	The part of a wave (peak, trough, or in between) at a given starting point in time (seconds UT).
phase error	See "time correction, time error."

preliminary early calibration matrices
An initial estimate of the early calibration matrices.

preliminary late calibration matrices
An initial estimate of the late calibration matrices.

prepfile	File of partially unpacked and re-ordered SSM telemetry data derived from a BC SSM data file. The input to APSM.
QuickSort	An algorithm that quickly sorts a set of values into a prescribed order.
quiet	Displaying low natural magnetic activity. Quiet periods generally have a low Kp or Ap.
R_A	3x3 matrix that rotates a 3x1 vector A degrees in the YZ plane.
R_B	3x3 matrix that rotates a 3x1 vector B degrees in the XZ plane.
R_C	3x3 matrix that rotates a 3x1 vector C degrees in the XY plane.
real	A number that does not involve j, the square root of -1. A complex number consists of two parts: real and imaginary. However, the letter "i" is usually used instead of "j."
residual	The error, or remainder, term of a least-squares equation. This term is a vector. The residual is denoted by "R."
rotation matrix	3x3 matrix $R_A R_B R_C$ that rotates a given 3x1 vector by an angle in each of the three dimensions.
sawtooth, short sawtooth	One of a series of parallel lines on the X-curve that appear close together and are often aligned perpendicular to the flow of the curve. A sawtooth error function with a shorter period. For more information see "long sawtooth" above.
shift	Difference in optimal value of time correction, or another quantity, between two periodic functions.
short sawtooth	See "sawtooth" above.
sinusoidal	Resembling a sine wave.
spike	A vertical offshoot from the baseline curve due to an impulse.

square norm	Square root of the sum-of-squares of the components of a vector.
SSM	Special-Sensor Magnetometer.
sunlight	Time that the satellite spent in the sun, which depends on the position of the satellite in the day/night cycle.
SV, or secular variation	Change in the modeled magnetic field over time.
terminator	See "(day-night) terminator" above.
TFR	Total-Field Record of F15-measured field strengths.
TFR file	Contains TFRs. An optional output of APSM.
thermal twist	Effective rotation of the magnetometer around up to three axes, by a function with maximums where the satellite crosses the terminator from day to night. Simulates a motion of the boom relative to the satellite induced by the heat of the sun and by cooling at night.
time correction, time error	The amount of time, in seconds, that a magnetic-field curve needs to be shifted horizontally to overlap another curve, reducing the difference between the two curves.
TLE	Two-Line Element that contains the orbital elements from which position information of a satellite can be derived. The TLE ephemeris consists of ephemeris derived from daily TLEs.
track	Series of the positions of a satellite over time.
trough	The bottom part of a curve, as opposed to its peak.
twist error	A deviation from the baseline curve due to a (simulated) force that twists the boom. The forces studied in this experiment are the continual, thermal, and impulse twists.
UT	Universal Time, or number of seconds since midnight at Greenwich Mean Time. Unlike the local time, the UT is independent of the satellite location.
valley	A low area between two nearby peaks on a curve.
wavy day	A data day with a strong sine wave in the Z-curve.

X-axis	A line, whose positive direction points down from a DMSP satellite towards the center of the earth.
X-value of AAVMMM	Average absolute value of the X-component of the MMM field over all data points in a given day.
XY-plane	The two-dimensional plane that contains the axes X and Y.
XZ-plane	The two-dimensional plane that contains the axes X and Z.
Y-axis	A line, whose positive direction points from a DMSP satellite in its direction of motion.
Y-value of AAVMMM	Average absolute value of the Y-component of the MMM field over all data points in a given day.
YZ-plane	The two-dimensional plane that contains the axes Y and Z.
Z-axis	A line, whose positive direction points from a DMSP satellite in the orbit-normal direction.
zero model	Derived from the IGRF-2000 magnetic-field model by setting all values of the coefficient array GT in APSM_IGRF_2000.INC to zero. The IGRF 2000 model with no correction for secular variation from the January 1, 2000 epoch.
Z-value of AAVMMM	Average absolute value of the Z-component of the MMM field over all data points in a given day.
Z-wave	A sine wave of significant amplitude in the Z-curve of some data days but not of others.